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A MONOGRAPH OF THE ITHOMIIDAE (LEPIDOPTERA)
PART III
THE TRIBE MECHANITINI FOX

BY

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Introduction

The first part of this monograph (1956) considered the general taxonomic position of the Ithomiidae, the major classification within the family and reviewed the tribe Tithoreini. A subsequent visit to the British Museum (Natural History) led to a few additions and emendations (Fox, 1960b) to that tribe. The second part (1960) dealt with the tribe Melinaeini. Again, some additions and emendations were subsequently recorded (Fox, 1965). The third part, presented here, deals with the tribe Mechanitini, composed of five closely related genera, *Xanthocleis, Forbestra* (new), *Mechanitis, Sais,* and *Scada.* This tribe includes some of the commonest ithomids and some of the most difficult.

Since its publication, A. Seitz' GROSSSCHMETTERLINGE DER ERDE has been the only comprehensive treatment of butterflies available and has been used as the basis for arranging collections and as the frame of reference for most revisionary studies. Its comprehensiveness is nearly the only good thing about "Seitz". Aside from the contributions of a few specialists like the late Dr. Jordan, the work as a whole is incredibly bad — the volume on American butterflies is especially unsatisfactory. In this volume, the handling of the ithomids stands out as inaccurate and confused.

This situation has led to numerous notes on the taxonomy of various ithomids and to some attempts at revising some of the genera. Of the Mechanitini, only *Scada* has not been covered. *Mechanitis* was treated by Forbes (1924, 1948) and by d'Almeida (1951), *Xanthocleis* by d'Almeida (1945), *Sais* by d'Almeida and Fox (1941).

For the present study, I began by disregarding the work of all previous specialists, assembled all available specimens of Mechanitini from all sources and then set out to discover what genera, species and subspecies seem to exist as biological entities. Only as a last step, did I identify names in the literature with specimens and determine the status of each name. It has been my aim, in short, to make the biological decisions first and to apply the clerical problems of taxonomy to the biological structure found. If the results of my work make any sense of these insects, so thoroughly confusing and so thoroughly confused by my predecessors, it is only because of the exceptionally extensive material I have been able to study.

Because of a certain diversity of usage in such matters, a word about the mechanics herein used in presenting synonymies would be helpful. The equals sign (=) precedes entries citing synonyms. Recombinations of species and genus names are given paragraph treatment without the equals sign. I have made no effort to signalize new combinations, (probably more in number than the old combinations) since I do not regard this aspect of clerical taxonomy as being important.

The comma is used to separate the name of a taxon and the name of an author other than the original author. It should be noted that Article 51(b)(i) of the International Code is under review and may be changed — in any event, the use of the comma for this purpose seems quite adequate.

Square brackets enclose citation of an entity which is not named by the author or is named improperly under the International Code. This latter category includes names proposed as quadrinomials or as aberrations. Such invalid names are cited for the sake of completeness but, in addition to enclosing the whole citation in square brackets, the names themselves are not italicized and are placed in quotation marks.

Presentation of geographic distributional data has been somewhat simplified in the present paper, as compared to the previous parts. Instead of citing the number, sex and collection for each station, the stations in most countries are grouped by state, province, department or territory (printed in bold face). This method is admittedly imperfect in that political boundaries do not necessarily coincide with biogeographic boundaries, but it is of assistance in mapping. The arrangement of countries and of subdivisions of countries is, in general, from north to south and from west to east.

Specific ecological information on most collecting stations is generally unavailable or tedious to find. Furthermore, it would be probably impossible to group the stations biogeographically, since there are so many factors with effects varying with the genus, species-group or species.

No seasonal information is given in this paper for two reasons. First, only a relatively small fraction of museum labels bear specific dates. Second, such dates as are given generally tend to indicate when collectors happened to be in the field rather than to define the periods when adult insects fly. Flight times may greatly diverge within a relatively few miles if, as for example in western Ecuador, the seasonal cycles are locally divergent.

The location and correct spelling of geographic place names is ever a vexing problem. Field workers have not always supplied accurate information with their specimens and certain commercial collectors have even deliberately given false localities in order to avoid competition at some productive "pet" locality. A few collectors customarily wrote on their envelopes only a "field number", which referred to a list in a notebook for locality and date of capture. This pseudo-scientific habit is reprehensible and accounts for all too many specimens without data.

The early collections were made by people working as classifiers and having but little interest in geographic information. "South America" or "Amazona" were considered sufficient and frequently only one specimen of a series was labelled. For example, the Hewitson Collection had few specimens with locality data and when it was turned over to the British Museum in 1878, W. F. Kirby added what he could from his own knowledge of the world fauna (Kirby, 1879) — at best, a process of reconstruction. The importance of biogeography began to be appreciated by lepidopterists before the end of the last century and the practice of putting specific information on the label became general.

Even today, however, not every curator takes the trouble to verify information given him from the field before he prepares labels. Consequently, one must ever be alert for a convincingly printed but incorrectly spelled or otherwise inaccurate label. Sometimes the interpretation of place names from labels becomes a form of cryptanalysis: one must consider the nationality of the collector and of the curator and try to deduce the correct spelling of a locality from the way the misspelling would have been pronounced. And of course, spellings of many place names and even the names themselves may change through the years.

For the neotropical localities, with which the present study is concerned, the best general source is the portfolio of "millionth maps" and the INDEX TO MAPS OF HISPANIC AMERICA published by the American Geographical Society. While not entirely up to date, this work is indispensable and I have used it as the authority for spelling all names I could find in it. The National Geographic Society has published fold-in maps of the neotropics and the more recent versions are useful for determining the settlement of boundaries since publication of the INDEX and for some of the "boom town" localities not found on older maps. Almost all the Latin American countries publish detailed maps and recent editions are mostly complete, accurate and excellent; unfortunately these maps often are difficult to obtain. Accounts of expeditions and local taxonomic lists often provide useful information; ornithologists have long been busy in this respect. I have found the following useful for difficult localities represented in American collections: Todd (1942) for parts of northern Colombia and northern Venezuela; Todd and Carriker (1922) for the Santa Marta region of Colombia; Carriker (1910) for Costa Rica; Brown (1941) for Ecuador.

ABBREVIATIONS

The following abbreviations are used to indicate the various museum and private collections owning specimens examined and reported in the geographic data:

AMNH, American Museum of Natural History, New York.
BM, British Museum (Natural History), London, England.
CAS, California Academy of Sciences, San Francisco, California.
CHS, private collection of C. Harrison Snyder, Metairie, Louisiana.
CM, Carnegie Museum, Pittsburgh, Pennsylvania.
CU, Cornell University, Ithaca, New York.
FMB, private collection of F. M. Brown, Colorado Springs, Colorado.
HR, private collection of Herman Real, San Jose, California.
JHM, private collection of John H. Masters, St. Paul, Minnesota.
MCZ, Museum of Comparative Zoology, Cambridge, Massachusetts.
MSU, Michigan State University, East Lansing, Michigan.
PM, Museum National d'Histoire Natural, Paris, France.
RM, Reading Public Museum and Art Gallery, Reading, Pennsylvania.
ST, Naturhistoriska Riksmuseum, Stockholm, Sweden.
USNM, United States National Museum, Washington, D. C.
ZMH, Zoologisches Museum der Humboldt-Universität, Berlin, East Germany.
ZSB, Zoologische Sammlung des Bayerischen Staates, Munich, West Germany.

Tribe MECHANITINI Fox

Mechanitini Fox, 1956: 22, 23. 1961: 25.

The male forelegs (figs. 12, 34, 61, 117, 132) are strongly aborted, with the femur shorter than the coxa, the tibia reduced to a small subovate structure bearing on its tip a tiny knob representing the vestigial tarsus. The same extreme reduction of the male foreleg is found in all tribes of Ithomiinae except the Tithoreini and Melinaeini.

The female forelegs (figs. 13, 14, 35, 36, 37, 62, 63, 64, 118, 119, 133, 134) apparently have only four tarsal subsegments. The post-tarsal retractive apodeme ("tendon") is attached at the tip of the terminal subsegment between two lateral lobes (figs. 14, 37, 64, 119), indicating that the apparent fourth subsegment, which is in fact formed by fusion of the true fourth and fifth subsegments, includes the vestigial post-tarsus. Tarsal spurs are present on the third subsegment, often also on the second and rarely on the first, according to genus, as detailed below. Near the tip, on the true fifth tarsal subsegment, there is a pair of laterally placed patches of trichoid sensilla (figs. 14, 37, 64, 119, 134) (Fox, 1967). Trichoid sensilla are also present on the third subsegment, sometimes arranged in easily noticed patches, sometimes reduced to one or two, but always fewer in number than on the fifth subsegment.

Venation (figs. 15-17, 38-40, 65-67, 120-122, 135-137) is quite similar in all five genera. The recurrent vein arises on the angle of the second discocellular vein of the hindwing, though the shape of the angle varies with the genus. In males the hindwing subcostal vein runs close beside the radius and emarginates near the apex. The hindwing subcosta of females of *Xanthocleis* is similar to that of the males but emarginates with an up-curve above or even proximal to the end of the cell. In the other genera the hindwing subcosta of females is coalesced with radius from the base to at least two-thirds of the distance to the end of the cell, with a free segment angled steeply to the costal margin and mostly shorter than the second discocellular vein. The humeral vein is bifid in all genera except *Scada*.

Male genitalia are essentially similar in all five genera, with a slender, pointed uncus and a hoodlike tegumen. The apex of the valve is produced in various ways. The gnathal membrane is only partly sclerotized, mainly along its posterior edge, giving the impression of a ribbon suspended beneath the tegumen-uncus. In *Scada* sclerotization of the gnathos is so slight that this structure is omitted from most drawings in this paper.

Male genitalia, at generic level, distinguished among *Xanthocleis, Sais, Scada* and *Forbestra-Mechanitis*; in these last two genera the genitalia are much alike. The five species of *Forbestra,* however, can be distinguished from each other by genitalic characters, but the same means cannot be used to separate species of *Mechanitis* from each other. Separation of species in *Xanthocleis* can be made by genitalia, though the differences are mostly slight and care must be exercised. In *Scada* the male genitalia are useful in separating species from each other and in associating them in species groups; in some cases identification requires examination of genitalia.

Fortunately, the genera of Mechanitini can be identified through use of external characters.

Key to the Genera of the Tribe Mechanitini

1. Humeral vein simple, non-bifid; very small butterflies with wings mostly yellow with black margins .... *Scada*
   Humeral vein bifid; medium to large butterflies 2
2. 2d of hindwing forming an acute or a right angle; in females Sc and R of hindwing not coalesced along basal two-thirds of cell, spurs present only on third foretarsal subsegment; large butterflies with transparent or translucent areas .... *Xanthocleis*
   2d of hindwing forming an obtuse angle; in females Sc and R of hindwing coalesced for at least two-thirds of the distance along the cell, spurs present on second foretarsal subsegment and sometimes also on the first; medium-sized butterflies with opaque wings 3
3. Cell of hindwing reaching about six-sevenths of the distance to the wing apex; 2d nearly straight, only slightly angled .... *Sais*
   Cell of hindwing about two-thirds the length of the wing, 2d strongly angled 4
4. Forewing with 1d present or M_1 stalked from R_s at a distance from the cell much less than the length of 3d; males with 1d of hindwing present and at least one-third the length of 2d; females with 1d present or M_1 of hindwing stalked from R_s at a distance from cell less than the length of 2d; comma mark of forewing formed from a streak between Cu_1 and Cu_2 .... *Mechanitis*
   Forewing with 1d absent and M_1 stalked from R_s at a distance from end of cell greater than the length of 3d; males with 1d of hindwing shorter than one-fourth the length of 2d, or absent; females with M_1 stalked from R_s of hindwing at a distance from cell at least as long as 2d; comma mark of forewing formed from two streaks, respectively over Cu_1 and Cu_2 .... *Forbestra*

PHYLOGENY

The genera of Mechanitini fall into three series: (1) *Xanthocleis,* (2) *Forbestra, Mechanitis, Sais,* and (3) *Scada.*

Xanthocleis appears to be the most primitive in that it has the least reduced forelegs and the least modified venation. The vestigial foretarsus of the male (fig. 12) is larger relative to the tibia than in the other genera; the length of the femur and trochanter together equals that of the coxa but in the rest of the tribe it is less than that of the coxa. The humeral vein of the hindwing is bifid with both branches long, while in *Forbestra, Mechanitis* and *Sais* the branches of the bifid humeral are short and in *Scada* the humeral is simple. The condition of the subcostal vein of the female hindwing (fig. 17) is particularly primitive as compared to other members of the tribe, since it is coalesced with the radius only at the very base of the wing, though by its shape and shortness it foreshadows the unique formation found in the other genera. On the other hand, *Xanthocleis* is more advanced than other Mechanitini with respect to the female forelegs, on which tarsal spurs have been lost on all but the third subsegment, and it is the only genus that has acquired pattern transparency.

Forbestra is more advanced than *Xanthocleis* in all structures except in the more generalized level of development of the female forelegs; in four of the five species of *Forbestra* there is a spur on the inner side of the tip of the first tarsal subsegment in addition to paired spurs on both the second and third subsegments (figs. 36, 37). The foretarsal spurs and the somewhat more generalized pattern suggest that *Forbestra* is less evolved than *Mechanitis*; a more simplified pattern and the very long hook on the tip of the male valve indicate that *Sais* is more advanced. These relationships are supported also by the venation. The free segment of the hindwing subcostal vein of females is longest in *Forbestra* (fig. 41) and branches opposite the cubital fork; in *Mechanitis* (fig. 67) it branches farther out, opposite the base of M_3, and is only a little longer than the second discocellular vein; in *Sais* (fig. 122) the subcostal segment branches near the apex of the discal cell and is shorter than the second discocellular.

Scada stands apart from the rest of the tribe because of the long, finger-like ventral process of the male valve (figs. 139-144, 152-157, 168-170) unique in the family, and by having the humeral vein simple, non-bifid (figs. 136, 137). Both features are evolved, as is the extremely simplified pattern of most species. In other respects *Scada* is no more advanced than *Mechanitis* and less so than *Sais*.

The derivation of the Mechanitini is obscure. The remarkable similarities of pattern and coloring between *Mechanitis* and *Melinaea* have led many past workers to assume an intimate phylogenetic association between the two genera. Forbes (1927), however, pointed out that, "there are no close relatives [of *Melinaea*]". Other than pattern convergence, the chief points in common between *Melinaea* and the Mechanitini are some details of hindwing venation. Like the

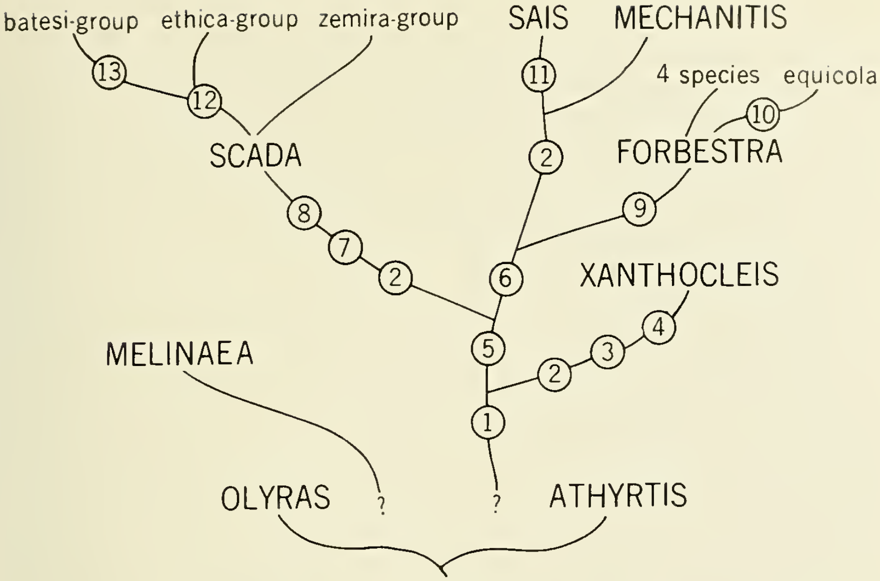

Fig. 1, phylogenetic chart of the Mechanitini. The possible derivation of the Melinaeini (see Fox, 1960: 118) and Mechanitini from the Tithoreini (see Fox, 1956: 24) is suggested. Encircled numbers indicate steps in structural evolution from previous conditions, as follows: 1, fourth and fifth subsegments of female foretarsus become fused. 2, spines on first foretarsal subsegment of females are lost. 3, spines on second foretarsal subsegment of females are lost. 4, male valves become assymetric. 5, basal two-thirds of Sc and R become coalesced on female hindwing; male foreleg is further minaturized, the femur and trochanter becoming shorter than the coxa. 6, both arms of the hindwing humeral vein are shortened. 7, distal arm of hindwing humeral vein is lost. 8, a finger-like process develops from the sacculus of the male valve. 9, outer spine of the first subsegment of the female foretarsus is lost. 10, inner spine of the first subsegment of the female foretarsus is also lost, thus the condition indicated by 2 is reached independently. 11, discal cell of hindwing is elongated to nearly seven-eighths of the wing length, and Sc and R coalesce almost to the apex. 12, tip of male uncus widened. 13, a second finger-like process develops from the anterior edge of the male valve.

Mechanitini, *Melinaea* has the recurrent vein placed at the apex of the angle of the second discocellular and the shortened subcostal vein in females (Fox, 1960: figs. 7-9) somewhat as in *Xanthocleis* (fig. 17). Other structures suggest divergence rather than relationship. The female forelegs of *Melinaea* are very little modified. The reduction of male forelegs (Fox, 1960: figs. 206) leads within the genus from a more generalized foreleg as found in Tithoreini toward the extremely reduced foreleg of all other tribes; apparently the extreme reduction of male forelegs has occurred polytypically in the Ithomiidae, and the situation in *Melinaea* illustrates the process rather than supports a phylogeny. A further point of divergence is that the forewing recurrent vein in *Melinaea* arises on the second discocellular vein; in Mechanitini the median veins all are shifted anteriorward, so that the recurrent vein, maintaining its position relative to the radius and cubitus, arises from the third discocellular vein.

Among the Tithoreini, only *Olyras* and *Athyrtis* suggest a relationship with the Mechanitini and, almost equally, with *Melinaea*. The hindwing venation of both (Fox, 1956: figs. 49, 57), with the recurrent arising on the second discocellular and with the shortened subcosta in females, is suggestive. Furthermore, in *Athyrtis* the subcosta of the female hindwing runs close beside the radius nearly to the cell apex, then sweeps abruptly upward to the margin, and the male genitalia (Fox, 1956: fig. 59) are assymetric: both features are also found in *Xanthocleis*. In *Olyras* the venation of both wings of both sexes is close to that of *Melinaea*; the formation of the hindwing subcostal in females is especially suggestive, being short but well separated from the radius.

The best guess — and in the absence of a fossil record, one can only guess — is that the Melinaeini and the Mechanitini each derived from an ancestral group in common respectively with *Olyras* and *Athyrtis*. The Mechanitini are a little closer to *Athyrtis* and *Melinaea* is a little closer to *Olyras* (fig. 1).

Life History

Jan Sepp, an Amsterdam naturalist, acquired a set of 150 colored drawings and accompanying field notes made by H. J. Scheller, Secretary to the Governor of Surinam. This material was published as SURINAAMSCHE VLINDERS (1828-1855). The second plate and accompanying text (1828) of this rare and fascinating volume records the life history stages of *Mechanitis polymnia polymnia* and is one of the earliest, if not the first such account for an ithomid. This plate is reproduced as the Frontispiece. The text, probably rewritten from Herr Scheller's notes, is worth quoting in full (my rather free translation):

"During the months of June and November the caterpillars of this butterfly are found on the plant called in French *"Morelle tres epineuse"* and in Latin *Solanum aculeatissimum.* At these two times of the year the caterpillars are quite common and as many as fifteen to twenty are found together. The female butterfly deposits her little white eggs separately, rather than in little masses, though she may place twenty or more on the same leaf, and a little later put a like number on another leaf of the same plant. This is shown on Plate 2, where about twenty-five of such eggs can be counted on the upper leaf, while on the lower leaf the female is shown in the position she assumes when depositing these eggs. As soon as the young caterpillars leave the eggs, they keep to the undersides of the leaves, where they live socially, eating a great deal and reaching in a short time their entire growth; from this it may be supposed that this species reproduces itself several times a year, although we have found them only during the months of June and November — that is, twice a year. Near the middle of the leaf depicted on the Plate can be seen this caterpillar, which is green and armed with yellow spines when full growth is reached; when they transform into the chrysalis, they become rather yellow and the chrysalis itself keeps this color for the first day following metamorphosis. The chrysalis at this stage is shown on the plate suspended from the stem of the leaf. The next day it becomes steel-colored, and later a beautiful silver color. The day before the butterfly is to emerge, it again changes color, becoming gilt yellow and then a somber brown; soon afterward the butterfly appears. These successive changes in color of the chrysalis take place within eight days. This insect rests only while it is a chrysalis, from the time it ceases to be a caterpillar until it emerges as a butterfly. At the top of the plate is shown a butterfly in flight, and the underside of another is shown farther down, posed on a leaf and depositing eggs."

Nearly a century and a half have passed since this account was written and the drawings made; relatively little has been added to our knowledge of the life histories of the Ithomiidae. Entomologists residing in the tropics have not fully taken advantage of their opportunities to study the living insects, and the current flurry of interest in life histories and food plants on the part of students in the temperate zone has not yet been effectively extended to the American tropics.

For the entire family, notes of varying fullness have been recorded on the life cycles of only twenty-two species, representing fourteen genera.

Among the Mechanitini, nothing has been published on *Xanthcleis, Forbestra, Sais* or *Scada.* It is, therefore, worth recording here that a female of *Xanthocleis aedesia aedesia* from El Valle, Sucre, Venezuela, in the collection of the United States National Museum bears a label noting that it was raised from a caterpillar that fed on *Cyphomandra betacea.* This plant, one of the family Solanaceae, is the Tree Tomato so widely cultivated by the Indians in South America. Since it is a native of Peru and western Brazil and an import in Venezuela, it seems likely that *aedesia* also feeds on other, related plants.

In addition to the account of *M. p. polymnia* published by Sepp, information on two other species of *Mechanitis* has been recorded. Guppy (1904: 227-228) noted that the eggs of *M. i. kayei* (as *veritabilis*) are spindle-shaped, pure white with thirteen longitudinal ridges, and that larvae are gregarious and sluggish; Kaye (1921: 16) stated that these larvae feed on a *Solanum* species.

Moreira (1881: 1-13; pl. 1) gave a careful description of the stages of *M. l. lysimnia* (as *Heliconia narcea*) and figured the adult, the mature larva and three color-stages of the pupa. He experimented with various possible food plants and recorded that he easily reared larvae on *Solanum conicum* and *Syphomandra velutina,* but obtained only partial or no development when larvae were given other species of Solanaceae or an asclepiad. Müller (1886: 241-242) described larval and pupal development of the same species and gave as the food plants several species of *Solanum,* especially *Solanum hirsutum.* d'Almeida (1922: 65-67) also described the development of *M. l. lysimnia* (as *albescens*) and mentioned *Solanum arrebenta* as the preferred plant. Biezanko (1960a, 1960b) added *Solanum auriculatum,*

Figs. 2-10, life history of *Mechanitis.* Fig. 2, copulating pair of *M. polymnia polymnia* Linné, at Villa Amazonica, Amapá, Brazil. Figs. 3-10, *M. isthmia eurydice* Haensch, at Tingo Maria, Huánuco, Peru. Fig. 3, cluster of eggs on upper side of leaf, including some empty shells from which larvae have hatched. Fig. 4, third instar larvae feeding. Figs. 5-6, a last instar larva shown in two attitudes. Figs. 7-8, newly formed pupa, which at this time is metallic pale gold. Fig. 9, a pupa just before eclosion, the wing pattern partly visible. Fig. 10, newly emerged adult clinging to pupal shell, the wings not yet expanded. Photographs by Dr. Edward S. Ross, California Academy of Sciences, and used by permission.


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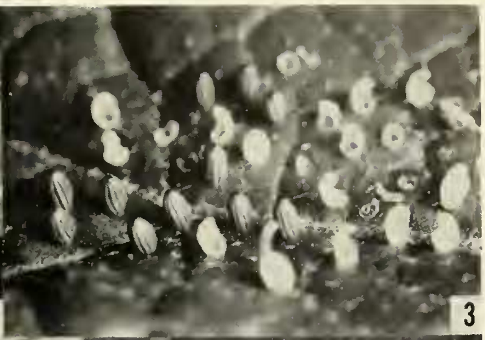
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S. tuberosum, Cyphomandra betacea, Lycopersicum esculentum and *Datura arborea,* all Solonaceae, as known food plants.

Through the kindness of Dr. Edward S. Ross I reproduce some of the beautiful photographs he took in 1955 at Satipo, Peru, of various stages in the development of *Mechanitis isthmia eurydice* (figs. 2-10). Eggs, larvae and pupae agree substantially with the descriptions cited previously for other members of the genus. Although Dr. Ross did not identify the plant on which *eurydice* fed, it appears from his pictures to be one of the Solanaceae, as would be expected. These pictures bring out several noteworthy features of ithomid developmental stages. One is the series of lateral protuberances on the gregarious larvae (figs. 4-6). F. M. Brown (private communication) has called ithomids "cog-wheel caterpillars". Another is the shape of the pupa (figs. 7-10) which I have previously emphasized (Fox, 1956: 18; fig. 11) is typically nymphaloid, rather similar to that of the Satyridae, a closely related family, and quite dissimilar to the pupa of the Danaidae.

With one exception, food plants recorded for Ithomiidae have been species of Solanaceae. It is interesting to note that, although information is available on the life histories of only twenty-two species of ithomids (eliminating synonyms), *Mechanitis lysimnia lysimnia* has been recorded as feeding on nine different plants belonging to four genera. Also, the only food plant record for *Xanthocleis aedesia aedesia,* a fairly common butterfly in northern Venezuela, is a cultivated plant imported into Venezuela and which cannot be the sole larval food. Eight other ithomids have been ascribed more than one food plant.

It is misleading, in view of the present state of knowledge, to generalize about the food specificity of the Ithomiidae (but see Ehrlich & Raven, 1965: 589, 593-594). Far more ground work needs to be laid before there are enough data to justify conclusions.

How, for example, is one to interpret the single known exception to the use of Solanaceae by neotropical Ithomiidae? Guppy (1904) discovered that larvae of *Tithorea harmonia megara* in Trinidad feed on *Echites,* of the family Apocyanaceae. It is tempting to interpret this association as evidence of evolution of the Ithomiidae from some Apocyanaceae-feeding stock, perhaps among the Danaidae, but *Tithorea* is a derived offshoot of the primitive ithomid tribe, and not really a primitive genus. It is not yet known whether *megara* utilizes alternative food plants — perhaps even some Solanaceae — or if use of *Echites* is typical of all the subspecies of *T. harmonia.* Nor is the larval food of *tarracina,* the other member of the genus, or of any other of the Tithoreini known.

MIMICRY

Anyone working with Ithomiidae is unavoidably confronted with the phenomenon of mimicry; every species in the entire family is superficially similar to some other butterfly or butterflies. There can be little doubt that this phenomenon has been brought about by the action of natural selection within the frame of evolution.

Three different levels — or are they kinds? — of mimicry are to be found among the Mechanitini, aside from the fact that they are involved in the usual mimetic combinations with non-ithomids.

Mechanitis polymnia doryssus in the Central American part of its range is confusingly similar to *M. menapis saturata,* and in northern Colombia and northern Venezuela to *M. isthmia veritabilis.* In the Rio Solimões region of Brazil *M. isthmia doryssides, M. polymnia polymnia, M. mazaeus mazaeus* and *M. egaensis egaensis* are found and they collectively form a mimetic combination, though all four are variable. Although some other ithomids and some non-ithomids enter both these combinations, of course, they need not be considered here. These *Mechanitis* apparently evolved from each other relatively recently — quite possibly in Pleistocene time or soon after (see discussion under Phylogeny, above). To become distinct species and to maintain specificity, it was only necessary for them to develop intersterility; these *Mechanitis* have done little more than that. They look alike because they are so closely related and so recently separated. Why other butterflies look like them or *vice versa* is a different, separate question.

Another kind of situation, one involving deeper evolutional and genetic differences, must exist between *Mechanitis* and *Forbestra.* Each of the five *Forbestra* species has at least one similar *Mechanitis* flying with it. These are cases of parallel evolution.

Another example of parallel evolution is found between *Scada ethica* and *Scada quotidiana,* members of two different species groups flying together in eastern Ecuador. Both species are quite rare and both shun open places.

In Part I of this series (Fox, 1956: 10) I suggested that cases of parallel evolution among closely related ithomids might not be attributable to mimicry, but could be explained on the basis of relationship alone. Brower (1936: 72) listed three possible alternatives to account for such situations: (1) convergent evolution in appearance due to Müllerian advantage, (2) parallel evolution, or lack of divergence, in appearance due to Müllerian advantage, or (3) parallel evolution in appearance without Müllerian advantage being involved. He then goes on to say that, among others, "Fox also failed to appreciate the three possible alternatives in his revision of the Ithomiidae." As a matter of fact, it should have been clear that I selected the third of his alternatives as the probable explanation.

A third level or kind of mimetic situation is found in *Scada*; there are several combinations of species in this genus that are so completely alike externally that they can be safely separated only by means of male genitalia. They would be classic cases of mimicry, except that they are not sympatric. *Scada majuscula majuscula* of the Guianas and *Scada theaphia* of Pará, Maranhõa and the Rio Purús, both belonging to the *ethica*-group, is one such combination. Similarly, *Scada philemon*, found from Surinam to Maranhõa, and *Scada batesi* individuals, when they lack the hindwing cross band (as most do), from the eastern Andean valleys form a combination. Again, close relationship, not Müllerian advantage, would seem to provide the best explanation.

The Bates-Müller explanation of the mimicry phenomenon was based on two assumptions: first, that some butterflies are "palatable" and some "unpalatable" to birds and other macropredators; second, that macropredators are the primary enemies of the butterfly fauna and, by implication, the major control of butterfly population numbers. Given these two assumptions, it would follow that if a "palatable" butterfly closely resembles an "unpalatable" butterfly, its appearance would deceive the macropredators and it would thus be saved from being eaten (Bates), or if two "unpalatable" species of butterflies are closely alike, they would simplify the learning process for young macropredators by presenting one fewer pattern to associate with distastefulness and thus the individual butterflies destroyed by experimenting macropredators would be divided between the two species.

In recent years there has been some interest in attempts to demonstrate that, given the Bates-Müller assumptions, the Bates-Müller conclusions must be true, and there has been special effort to support the first of the assumptions. This activity is quite valid: the mimicry phenomenon is a challenging area for investigation. It is regrettable that the Bates-Müller explanation has been adopted more as an article of faith than as a testable hypothesis: I know of no scientific theory which seems, through the years, to have generated so much emotional advocacy since the elder Huxley debated the Bishop. True, there have been many reports of experiments purporting to demonstrate the Bates-Müller theory; almost without exception such studies have been designed to prove preconceived conclusions and have been marked by a singular lack of objectivity.

For example, Brower *et al.* (1963) caged some Silverbeak Tanagers, *Rhamphocelus carbo magnirostris*, a fruit-eating, partially insectivorous Trinidadian bird, and fed them a series of heliconine butterflies which had been killed by deep-freezing, then thawed for feeding. One of the stated purposes of this experiment was to provide an answer to a question basic to the Müllerian theory, "Are these insects unpalatable to bird predators?" (page 67). Of course, the insects proved to be unpalatable to the Silverbeak Tanagers, and impressive statistical methods were used to ensure accuracy. Probably this information is of interest to ornithologists concerned with the dietary habits of this bird; nothing was learned about the palatability of Heliconiinae to bird predators, as only one bird species was observed. According to Junge and Mees (1958), 347 species of birds, including about 60 migrant visitors, occur on Trinidad. It appears that tests remain to be made on the significant sampling of the various genera and species of bird predators on the island — at least another 100 experiments such as the one conducted with the Silverbeak Tanager — before anything like an answer such as Brower professed to provide can be reached.

The point is that it may be safely assumed that every insect species, including the "unpalatable" Heliconiinae, Danaidae and Ithomiidae, are regularly attacked by *some* predator or predators. The old saw that "one man's meat is another man's poison" is apt. There is considerable evidence that even the classically "unpalatable" danaids serve as food for certain macropredators. Petersen's (1964) observations are the most recent. An example of the emotionalism centering around discussions of mimicry is that Sheppard (1965) saw fit to bring the weight of his prestige and reputation to bear by attacking this little article by a young graduate student, apparently to avoid the least doubt being shed upon the Bates-Müller explanation. In addition to references given by Petersen (1964), the use of danaids as food for birds under natural conditions has been reported, for example, by Collinette (1928: 407), who could hardly believe his eyes. If the danaids have natural enemies, natural selection in danaids would be concerned with them, and other species would only be increasing their risks by copying the danaid pattern.

Aside from the obvious but stubbornly ignored fallacy of the first assumption underlying the Bates-Müller explanation, studies on pathogens and micropredators of insects (Steinhaus' pioneering work in insect pathology is pertinent) suggests that a more important control of insect populations is disease. Larval diseases probably exert an exceedingly strong selection pressure which would affect the entire gene compliment: kill the larvae and the species does not survive, but let a female live only long enough to lay viable eggs and the macropredators can have their way without harm to the insect species. In short, it may matter not at all whether a butterfly is "palatable" or "unpalatable".

I do not wish to give the impression that I am opposed to or that I deny the Bates-Müller explanation of mimicry. The mimicry phenomenon demands objective study and all theories to account for it should be tested by properly designed experiments. One of the most promising approaches should be through comprehensive analysis of the food webs in various tropical ecologies. True, this would be a long-term project and does not lend itself to short tropical vacations, but it should lay a sounder foundation than casual observations, however decorated mathematically, on the odd bird or toad. I concur with Sheppard's (1965) plea for an end to ill-designed experiments on mimicry. It is time to apply scientific thinking: a theory should not be supported by acclamation alone.

Check List

A check list for the tribes Tithoreini and Melinaeini has previously been presented (Fox, 1961, 1965). Following the same system, *Xanthocleis* becomes genus 10. Species are assigned consecutive numbers within each genus, subspecies are lettered and synonyms are listed. There follows a list of the Mechanitini:

10. Genus *Xanthocleis* Boisduval, 1870. (=*Aprotopos* Kirby, 1871. = *Thyridia,* Doubleday, 1847 (not Hübner, 1816).)
    - 10.1a *Xanthocleis aedesia melantho* (Bates), 1866. (=*randolis* Haensch, 1909). Guatemala to western Panama.
    - 10.1b *Xanthocleis aedesia aedesia* (Doubleday & Hewitson), 1847. Panama-Colombia frontier east to Guyana and south to central Colombia and northwestern Brazil.
    - 10.2 *Xanthocleis ceto* (C. & R. Felder), 1865. (=*colombiana* Godman & Salvin, 1898). Venezuela, Colombia, Ecuador and western Brazil.
    - 10.3a *Xanthocleis psidii psidii* (Linné), 1758. French Guiana, Surinam and Pará, Brazil.
    - 10.3b *Xanthocleis psidii ino* (C. & R. Felder), 1862. Colombia to Bolivia and northwestern Argentina, including western Brazil.
    - 10.4a *Xanthocleis hippodamia hippodamia* (Fabricius), 1775. (= *pytho* C. & R. Felder, 1860. =*pallida* Godman & Salvin, 1898. = *simplicior* Zikan, 1935, ab. = "Posticapura" Bryk, 1953, ab.). Southeastern Brazil west into Paraguay and north to southern Pará.
    - 10.4b *Xanthocleis hippodamia cetoides* (Rosenberg & Talbot), 1914. Central and possibly northern Peru.
11. Genus *Forbestra* new genus. (*Mechanitis* of authors, in part).
    - 11.1a *Forbestra equicola equicola* (Stoll), 1780. (=*sylvanoides* Godman & Salvin, 1898). Guianas and northeastern Brazil as far west as Teffé.
    - 11.1b *Forbestra equicola equicoloides* (Godman & Salvin), 1898. Southernmost Colombia, eastern Ecuador, northern Peru and adjacent Brazil to Teffé.
    - 11.2 *Forbestra proceris* (Weymer), 1884. Southern Colombia, eastern Ecuador, northern Peru and adjacent Brazil.
    - 11.3 *Forbestra aeneola* new species. (=*huallaga* Staudinger, in part). Peru and adjacent Brazil to Rio Jurúa and Rio Madeira and possibly northern Bolivia.
    - 11.4 *Forbestra olivencia* (Bates), 1862. (=*huallaga* Staudinger, 1884. = "jurimaguensis" Staudinger, 1885, ab.). Eastern

Ecuador, Peru, southernmost Colombia, adjacent Brazil including Acre.

11.5a *Forbestra truncata juntana* (Haensch), 1903. Rio Caquetá and upper Rio Putumayo, Colombia, south through eastern Ecuador and Peru into Bolivia, with adjacent Brazil.

11.5b *Forbestra truncata truncata* (Butler), 1877. (=*olivencia*, Forbes (not Bates), 1948). Lower Rio Putumayo and northern Peru east along the Amazon to lower Rio Madeira.

11.5c *Forbestra truncata oiticicai* (d'Almeida), 1951. Lower Amazon.

12. Genus *Mechanitis* Fabricius, 1807. (=*Nereis* Hübner, 1808 [preoccupied Linné, 1758]).

12.1a *Mechanitis isthmia isthmia* Bates, 1863. (=*lycidice* Bates, 1864. =*californica* Reakirt, 1865. =*ovata* Distant, 1876 (♀). =*arcana* Haensch, 1909, ab.). Mexico to Panama.

12.1b *Mechanitis isthmia veritabilis* Butler, 1873. Northern Colombia and northern Venezuela.

12.1c *Mechanitis isthmia bolivarensis* new subspecies. Bolívar, Venezuela.

12.1d *Mechanitis isthmia kayei* new subspecies. Trinidad.

12.1e *Mechanitis isthmia caucaensis* Haensch, 1909. (=*werneri* Hering, 1925). Colombia, in the valley of the Rio Cauca above Medellin.

12.1f *Mechanitis isthmia chimborazona* Bates, 1864. Western Colombia and western Ecuador.

12.1g *Mechanitis isthmia doryssides* Staudinger, 1884. (=*travassosi* d'Almeida, 1951. =*proceriformis* Bryk, 1953.) Southeastern Colombia, northeastern Peru, Rio Solimões and Acre, Brazil.

12.1h *Mechanitis isthmia eurydice* Haensch, 1905. (="argentea" Prüffer, 1922.) Eastern Ecuador to central Peru at higher tropical altitudes.

12.2 *Mechanitis lanei* new species. Southeastern Pará and Maranhõa, Brazil.

12.3 *Mechanitis limnaea* Forbes, 1930. Guianas and Pará, Brazil.

12.4a *Mechanitis polymnia doryssus* Bates, 1864. (=*utemaia* Reakirt, 1866, ab. = *labotas* Distant, 1876, ab. = "extrema" Hoffmann, 1940, ab.) Mexico through northern Colombia and most of northern Venezuela.

12.4b *Mechanitis polymnia solaria* Forbes, 1948. Northeastern Venezuela and Trinidad.

12.4c *Mechanitis polymnia polymnia* (Linné), 1758. (=*plagigera* Butler. =*apicenotata* Zikan, 1941. =*mauensis* Forbes, 1948, var. =*bipuncta* Forbes, 1948, var. =*sanctigabrielis* Bryk, 1953.) Bolívar, Venezuela, the Guianas and lower Amazon.

12.4d *Mechanitis polymnia angustifascia* Talbot, 1928. Southwestern

Brazil, Peru, Bolivia and Mato Grosso.

12.4e *Mechanitis polymnia casabranca* Haensch, 1905. Southeastern Brazil.

12.5a *Mechanitis mazaeus beebei* Forbes, 1948. Northeastern Venezuela.

12.5b *Mechanitis mazaeus pannifera* Butler, 1877. (=*visenda* Butler, 1877.) Guianas and Pará.

12.5c *Mechanitis mazaeus mazaeus* Hewitson, 1860. (=*fallax* Butler, 1873, var. ="plagifera" Staudinger, 1885. =*septentrionalis* Appolinar, 1928. =*williamsi* Fox, 1941, ab. =*foxi* d'Almeida, 1951, ab. =*nigroapicalis* Haensch, 1909, ab.) Colombia, eastern Ecuador, Peru, east to Teffé and in Acre.

12.5d *Mechanitis mazaeus elevata* Riley, 1919. Middle and lower valleys of Rios Purús and Madeira, Brazil.

12.5e *Mechanitis mazaeus pothetoides* d'Almeida, 1951. Mato Grosso, Brazil.

12.6a *Mechanitis egaensis phasianita* Haensch, 1909. (=*lucifera* Haensch, 1909, ab. =*obumbrata* d'Almeida, 1951, ab.) Eastern Ecuador and northern Peru, valley of Rio Jurúa.

12.6b *Mechanitis egaensis egaensis* Bates, 1862. (=*obscura* Butler, 1877, ab.) Teffé to Tabatinga, Brazil.

12.6c *Mechanitis egaensis contracta* Riley, 1919. Lower Rio Madeira.

12.7a *Mechanitis messenoides messenoides* C. & R. Felder, 1865. Colombia.

12.7b *Mechanitis messenoides deceptus* Butler, 1873. (=*simplex* Bryk, 1953, ab. =*holmgreni* Bryk, 1953, ab.) Eastern Ecuador and Peru.

12.7c *Mechanitis messenoides ballucatus* new subspecies. Bolivia and just over the frontier in southeastern Peru.

12.8a *Mechanitis menapis saturata* Godman, 1901. Mexico to Panama and Choco, Colombia.

12.8b *Mechanitis menapis caribensis* new subspecies. Northern Colombia, northern Venezuela and Trinidad.

12.8c *Mechanitis menapis menapis* Hewitson, 1855. (=*franis* Reakirt, 1868, ab. =*peruana* Hopffer, 1879.) Central Colombia.

12.8d *Mechanitis menapis occasiva* new subspecies. Pacific drainage in the Colombian states of Cauca and Valle de Cauca.

12.8e *Mechanitis menapis mantineus* Hewitson, 1869. Western Ecuador and Nariño, Colombia.

12.9a *Mechanitis lysimnia macrinus* Hewitson, 1860. (=*numerianus* C. & R. Felder, 1865. =*blissi* Fox, 1942, ab. ="escalantei" Hoffmann, 1940, ab.) Honduras and Nicaragua south through northern and central Colombia and along the Pacific slopes into western Ecuador.

12.9b *Mechanitis lysimnia elisa* Guérin-Méneville, 1844. (= *menecles* Hewitson, 1860. = *ocona* Druce, 1876, ab. = *vilcanota* Röber, 1904. = *acreana* d'Almeida, 1950, ab. = *roqueensis* Bryk, 1953.) Rio Putumayo, Colombia, south through eastern Ecuador, Peru, Bolivia, northern Argentina and in Acre to the Rio Madeira in Brazil.

12.9c *Mechanitis lysimnia connectens* Talbot, 1928. Mato Grosso, Brazil.

12.9d *Mechanitis lysimnia nesaea* Hübner, 1820. (= *sulphurescens* Haensch, 1909.) Northeastern Brazil to the middle of Goyez and the northern third of Minas Geraes.

12.9e *Mechanitis lysimnia lysimnia* (Fabricius), 1793. (= *narcea* Moreira, 1881. "albescens" Haensch, 1905, ab.) Southeastern Brazil, Paraguay, northern Argentina.

13. Genus *Sais* Hübner, 1816.

13.1a *Sais rosalia mosella* (Hewitson), 1867. (= *virchowii* Dewitz, 1877). Santa Marta Range, Colombia, and northern Venezuela.

13.1b *Sais rosalia rosalia* (Cramer), 1779. (= *camariensis* Haensch, 1905). Bolívar, Venezuela, east through the Guianas and thence south along the coast to Maranhõa.

13.1c *Sais rosalia promissa* Weymer, 1884. (= *klagesi* Avinoff, 1926. = *schatzi* Zikan, 1941. = *huebneri* Zikan, 1941. = *sanctibernardi* Bryk, 1953). Caquetá, Vaupes and Amazonas, Colombia, and the Rios Negro, Solimões, Purús and Madeira, Brazil.

13.1d *Sais rosalia zitella* (Hewitson), 1868. Eastern Ecuador, northern and central Peru and upper Rio Jurúa, Brazil.

13.1e *Sais rosalia badia* Haensch, 1905. (= *brasiliensis* Talbot, 1928). Cochabamba and Santa Cruz, Bolivia, and Mato Grosso, Brazil.

13.1f *Sais rosalia rosalinde* Weymer, 1890. (= *paraensis* Haensch, 1905). Rio Tapajós and Rio Tocatins southeast across Brazil to São Paulo and Guanabara.

14. Genus *Scada* Kirby, 1871. (= *Salacia* Hübner, 1823, preoccupied Lamouroux, 1816. = *Heteroscada* Schatz, 1886).

A. *zemira*-group

14.1 *Scada zemira* (Hewitson), 1856. Western Ecuador.

14.2 *Scada kusa* (Hewitson), 1874. Western Ecuador and the northwestern corner of Peru.

14.3 *Scada ortygia* (Druce), 1876. (= *garleppi* Haensch, 1909, *nomen nudem*). Southeastern Peru, Bolivia.

14.4 *Scade huascara* new species. Amazonas, Colombia.

14.5 *Scada delicata* Talbot, 1932. "Brazil".

14.6 *Scada karschina* (Herbst), 1792. (=*euritaea* Drury, 1782, not Cramer. =*gazoria* Godart, 1819. =*phyllodoce* Hübner, 1823. =*yanina* Hewitson, 1856). Southeastern Brazil.

B. *ethica*-group

14.7 *Scada ethica* (Hewitson), 1861. (=*lamidia* Bryk, 1953). Eastern Ecuador and northern Peru.

14.8 *Scada reckia* (Hübner), 1806. Pernambuco and Bahia, Brazil.

14.9 *Scadea theaphia* (Bates), 1862. Amazon valley from Pará and Maranhõa to Rio Purús in Acre.

14.10 *Scada echo* new species. Eastern Pará, Brazil.

14.11a *Scada majuscula majuscula* Haensch, 1905. Bolívar, Venezuela and Guyana.

14.11b *Scada majuscula junina* Bryk, 1953. Eastern Peru.

14.12 *Scada philemon* (C. & R. Felder), 1867. Surinam, French Guiana and south near the coast to Maranhõa.

C. *zibia*-group

14.13a *Scada zibia xanthina* (Bates), 1866. Nicaragua, Costa Rica and Panama.

14.13b *Scada zibia zibia* (Hewitson), 1856. (=*amplificata* Haensch, 1905). Northern and central Colombia.

14.13c *Scada zibia zeroca* new subspecies. Western Colombia and western Ecuador.

14.14a *Scada quotidiana perpuncta* Kaye, 1918. Southeastern Colombia.

14.14b *Scada quotidiana quotidiana* Haensch, 1903. Eastern Ecuador.

14.15 *Scada batesi* Haensch, 1903. (=*nigrocollaris* Bryk, 1953. =*dubia* Bryk, 1953). Central Colombia to southern Peru, with adjacent Brazil.

Genus XANTHOCLEIS Boisduval

Xanthocleis Boisduval, 1870: 30. Type-species: *Thyridia aedesia* Doubleday and Hewitson, designated by Scudder, 1875. Scudder, 1875: 288. Aurivillius, 1882: 45. Weymer, 1890: 9, 17, 33. Haensch, 1899: 6. Bryk, 1937: 497. Fox, 1940: 165, 172, 174, 181; pl. 8, fig. 57. d'Almeida, 1942: 196. 1945a: 97-112; pls. 1-3. Fox, 1949: 11. 1956: 22. Bryk, 1953: 32.

=*Aprotopos* Kirby, 1871: 19. Type-species: *Thyridia aedesia* Doubleday and Hewitson, designated by Kirby, 1872. Kirby, 1873: 359. Staudinger, 1885 [1884-1888]: 56. Haensch, 1909: 127. Kremky, 1925: 144, 147, 148, 158, 159, 176, 182, 198-201; figs. 53-58, pl. 23, fig. 1. Bryk, 1937: 498 (synonymy). Fox, 1940: 181 (synonymy). Forbes, 1941: 2-4. d'Almeida, 1942: 180.

Papilio (part) Linne, 1758: 466. Fabricius, 1775: 461.

Heliconia (part), Latreille, 1820: 212.

Ithomia (part), Doubleday, 1847 [Doubleday, Westwood & Hewitson, 1846-1852]: 125.

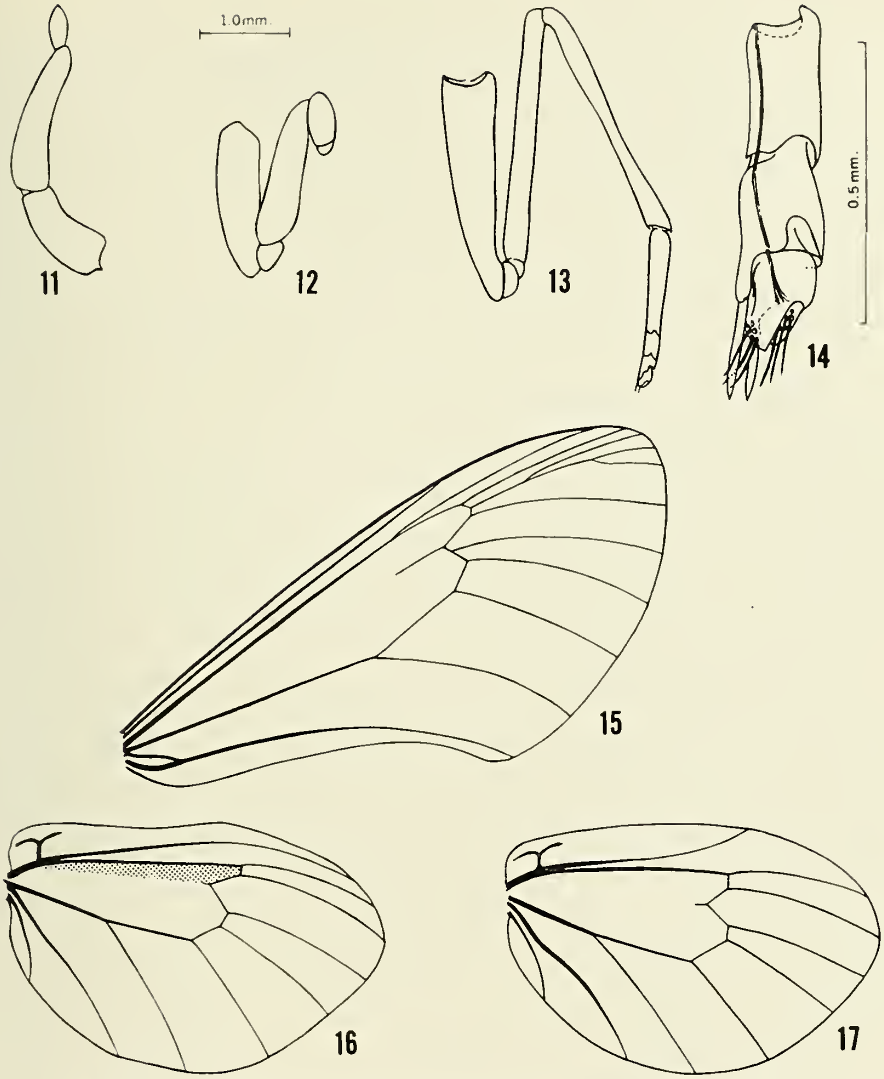
=*Methona*, Druce (not Doubleday), 1876: 206. Hopffer, 1879: 91. Haensch, 1903: 168. Hall, 1925: 165. d'Almeida, 1937: 251.

=*Thyridia*, Doubleday (not Hübner), 1847 [1846-1852]: 118. C. & R. Felder, 1860: 102. 1862: 75. Bates, 1862: 520. Herrich-Schaeffer, 1864 [1864-1865]: 175. Kirby, 1871: 19. Druce, 1876: 208. Schatz, 1885 [1885-1892]: pl. 10. 1886 [1885-1892]: 92. Godman & Salvin, 1879 [1879-1901]: 16; pl. 4. Haase, 1893: 53. Kaye, 1905: 85. Poulton, 1908: 7, 8-11.

Boisduval (1870) recognized the generic distinction between *Thyridia* Hübner and the deceptively similar ithomines with red spots at the bases of the forewings and with different venation; for the latter he proposed *Xanthocleis*. Kirby (1871) reached the same biological conclusion, but overlooking Boisduval's name, proposed *Aprotopos* for the red-shouldered species.

Aside from the necessity of separating *Thyridia* and *Xanthocleis*, an action some lepidopterists of the mid-nineteenth century were not prepared to accept, additional confusion centered on the problem of which genus should properly receive the name *Thyridia*. Scudder (1875) designated *Papilio psidii* as identified by Cramer as the type-species of *Thyridia*. Unfortunately, and as Butler (1875) pointed out, *P. psidii*, Cramer was not *P. psidii* Linné. Aurivillius (1882) figured the type specimen of *P. psidii* Linné, noting that it belongs in *Xanthocleis*, and also called attention to the fact that Cramer had misidentified the species. Practices then prevailing permitted either of two decisions: (a) that the type-species of *Thyridia* be *P. psidii*, Cramer, or (b) that the type-species of *Thyridia* be *P. psidii* Linné, which Cramer thought he had. Our present Code resolves the question in favor of the former, not the latter decision, but eighty years ago it was not so simple.

The result of conflicting viewpoints was that every major work dealing with ithomines during the last half of the nineteenth and the beginning of the twentieth century avoided the Boisduval name and circulated synonymous names or just combined the two entirely unrelated genera. Staudinger (1884-1888) lent his influence to Kirby's *Aprotopos*, an error repeated by Haensch (1909). Schatz (1885-1892) combined the genera as *Thyridia*. Godman and Salvin (1879-1901) disagreed with Butler and Aurivillius and used *Thyridia* for *Xanthocleis* and *Methona* for *Thyridia*.



Figs. 11-17, morphological characteristics of the genus *Xanthocleis*. Fig. 11, palpus; fig. 12, male foreleg; fig. 13, female foreleg; all to same scale. Fig. 14, detail of female foretarsus. Fig. 15, forewing; fig. 16, male hindwing; fig. 17, female hindwing; about twice natural size. All drawn from *X. a. aedesia* (Doubleday & Hewitson).

Palpi (fig. 11). — The deeply curved first segment appressed closely to the head, the second segment lightly curved and standing free, one-half longer than the first, and the terminal segment ovate and about one-third the length of the first segment.

Antennae. — With relatively well thickened clubs which are always straw yellow in contrast to the dark shafts, are three-fifths the length of the body and three-sevenths the length of a forewing.

Male forelegs (fig. 12). — Strongly reduced; the femur plus trochanter are as long as the stout articulate coxa; the tarsus is reduced to a knob fused on the tip of the subovate tibia and separated from it only by a suture, these two terminal segments being one-third the length of the coxa.

Female forelegs (figs. 13, 14). — Reduced but the coxa is articulate; the tarsus has only four apparent segments, of which the first is more than twice the length of the other three combined and is slender; the second and third segments are subovate and slightly compressed; the fourth is cylindrical and is terminally notched between lateral lobes, each of which bears a patch consisting of about a dozen trichoid sensillae. Spurs are present at the tip of the third tarsal segment but not on the first or second.

Venation (figs. 15-17). — on the forewing 1d is present but minute in both sexes; 2d is angled so that the upper segment is four to eight times the length of the lower; 3d is the same length as or a little shorter than the lower segment of 2d; the recurrent vein is well developed and arises from the apex of the angle of 2d, while a lower recurrent vein sometimes is present on 3d. R_2 usually branches a little distance beyond 1d, sometimes opposite it or, in a few females, proximal of 1d.

Hindwing. — the humeral strongly bifid; Sc and R separate from each other at the base. In males Sc reaches the margin at the wing apex near the tip of the down-curved R_s; in females it is shorter, reaching the margin in an up-curve at a point opposite to or proximal of the cell apex. 1d and 3d are short and straight; 2d is sharply angled and the two segments are of about equal length; a short recurrent vein arises at the apex of the angle of 2d. In males the hair patch is undivided and runs from the base to the apex of the cell.

Male genitalia (figs. 18-22). — Tegumen is hood-like but produced anteriorward very little and not separated from the uncus by a suture. Uncus is pointed, stout, down-curved at its terminus and tipped with a short tooth. Gnathos is sclerotized only along its dorsal part and is formed as two long narrow ribbons with their proximal ends articulating at the juncture of vinculum and tegumen-uncus and suspending a widened central membrane. Saccus is slender, slightly dilated at its tip and a little longer or a little shorter than the tegumen-uncus — a variation that appears to be individual. Penis is slender,

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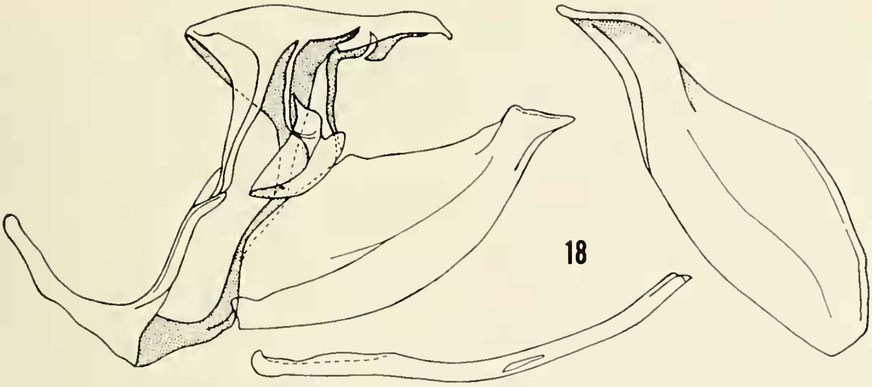
Figs. 18-22, male genitalia of Xanthocleis, the penis and the dissected left valve shown separately; all drawn to same scale. Fig. 18, *X. a. aedesia* (Doubleday & Hewitson), Colombia; slide 199, CM. Fig. 19, *X. ceto* (C. & R. Felder), Caracas, Venezuela; slide 1193, ZSB. Fig. 20, *X. p. psidii* (Linné), Bolívar, Venezuela; slide 492, CM. Fig. 21, *X. pytho* (C. & R. Felder), paratype without locality data; slide 1333j, BM. Fig. 22, *X. pallida* (Godman & Salvin), holotype, Chapada, Mato Grosso, Brazil; slide 1210j, BM.



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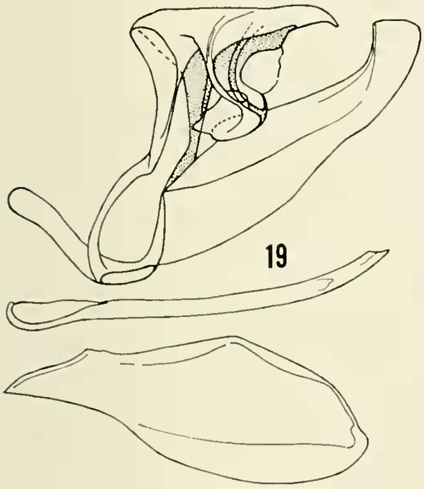

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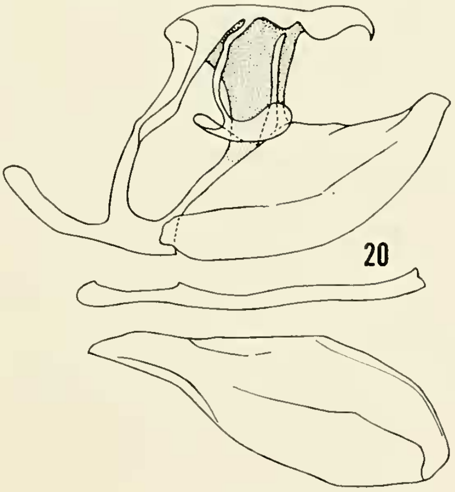

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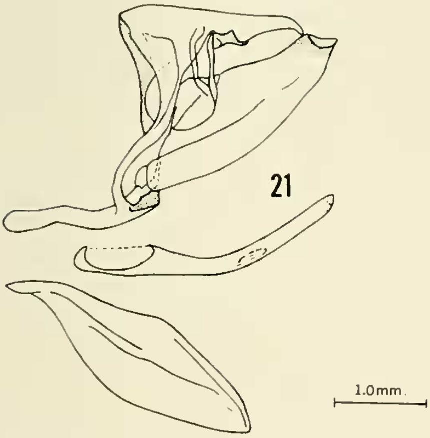

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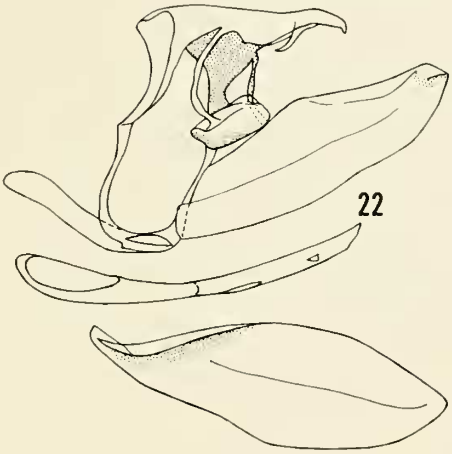

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from one-and-one-half to twice the length of the tegumen-uncus, the posterior half up-curved; foramen is one-fourth to one-third the length of the penis. Valves are roughly triangular and always assymetric, the left valve being at least ten percent longer than the right; in normal position, the apex of the left valve lies about the apex of the right; the fold of the sacculus ends before reaching the apex; valve apices produced into flattened extensions, the right and left sides dissimilar, the exact shapes varying with the species.

The preparations of male genitalia we have made in this genus show a latitude of individual variation and a latitude in size which is rather unusual in ithomines. Furthermore, the flexibility and size of the projections on the valves make it imperative to exercise great care in interpreting their shape, as it is difficult to mount them on slides to advantage.

The most recent review of *Xanthocleis* (d'Almeida, 1945) listed five species and nine subspecies — essentially those recognized by Haensch (1909). According to male genitalia, there are but four species and a correlation of pattern characters with geographic distribution indicates that there are eight subspecies.

Key to the Species of Xanthocleis by Male Genitalia

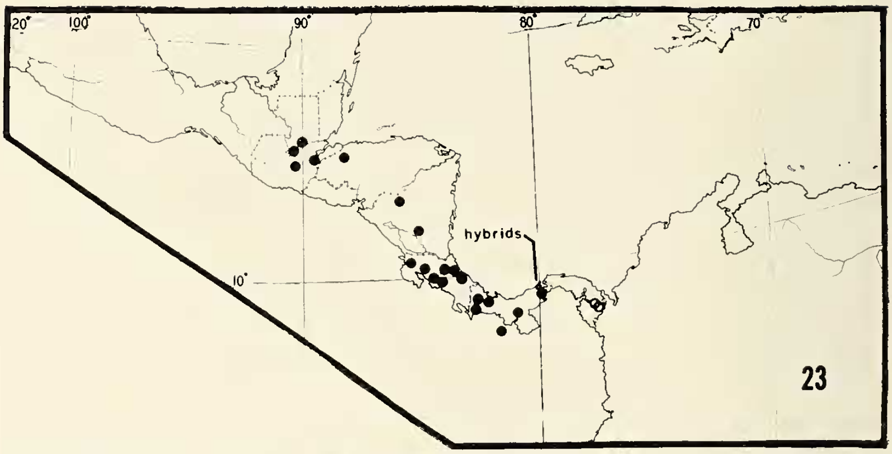
1. Penis proportionately longer, 175 to 200% of the length of tegumen plus uncus; apices of both valves produced into flared projections 2
   Penis proportionately shorter, 150 to 170% of the length of tegumen plus uncus; projection on apex of right valve tapered or with its sides parallel; projection on apex of left valve (the larger) only a little or not at all flared 3
2. Projections of both valves strongly flared, much wider at their tips than at their necks (fig. 18) and (in natural position) always infolded .... *X. aedesia* (Doubleday & Hewitson)
   Projections of both valves rather elongated, lightly flared; projection on left valve with a squared tip; that on right valve with an oblique tip (fig. 19) and (in natural position) neither is infolded .... *X. ceto* (Felder & Felder)
3. Left valve terminating in a more or less pointed projection; right valve with its projection rounded (fig. 20) .... *X. psidii* (Linné)
   Left valve terminating in a large projection with a rounded tip; right valve with its projection square-tipped (figs. 21, 22) .... *X. hippodamia* (Fabricius)

Key to Species and Subspecies of Xanthocleis

1. M_3 of forewing covered with a heavily scaled dark bar which separates the transparent patches above and below it .... (*aedesia*) 2
   M_3 of forewing not heavily scaled and the transparent patch continuous from costa to Cu_1 4
2. Base of forewing black, at most with a small white or transparent spot; light areas of hindwing red-tawny .... *X. a. melantho* (Bates)
   Base of forewing and light areas of hindwing yellow-tawny 3
3. Distal edge of dark bar over 4d of forewing straight; a transparent-tawny bar in the end of the cell above radius .... *X. a. aedesia* (Doubleday & Hewitson)
   Distal edge of dark bar over 4d of forewing convex; no transparent-tawny above radius at end of discal cell .... *X. a. catenata* new subspecies
4. Black bar crossing Cu_1 and discocellulars of forewing, with a narrow toothed extension over the basal half of M_3; black cross bar of hindwing widened and lightly angled at M_2-M_3, at least on the underside .... *X. ceto* (Felder & Felder)
   Black bar crossing Cu_1 and discocellulars of forewing with its distal edge straight, or with only a short, blunt projection at the base of M_3 not extending out over the vein; black cross bar of hindwing not angled or widened at M_2-M_3 5
5. Cross bar of hindwing vestigial or reduced, always much narrower than cross bar in forewing discal cell and generally broken at the base of M_3 .... (*hippodamia*) 6
   Cross bar of hindwing always complete, unbroken and nearly the same width as the cross bar in the forewing discal cell .... (*psidii*) 7
6. Translucent areas clouded whitish, yellowish or red-brown .... *X. h. hippodamia* (Fabricius)
   Translucent areas clouded brownish yellow .... *X. h. cetoides* (Rosenberg & Talbot)
7. Cross bars on both wings narrow, so that the hyaline spot in base of forewing cell is fully as long as the one in the cell apex .... *X. p. ino* (Felder & Felder)
   Cross bars of forewing wide, so that the hyaline spot in base of forewing cell is shorter than the one in the cell apex .... *X. p. psidii* (Linné)

Xanthocleis aedesia

The two subspecies of *aedesia* are so different in general appearance that they have always been treated as being distinct species. Closer examination, however, shows that the only real difference in the patterns is the coloring and that the male genitalia are essentially identical. Furthermore, hybrids occur where their respective distributions approach each other in Panama.



Figs. 23-24, distribution of species and subspecies of *Xanthocleis*. Fig. 23, Central America: solid circles, *X. a. melantho* (Bates). Fig. 24, South

X. a. melantho, the Central American subspecies, is found from Guatemala to Cerro Campana, Panama, the first group of high hills to the west of the Canal Zone (fig. 23). *X. a. aedesia,* the continental subspecies, reaches British Guiana and the upper Rio Negro valley of Brazil to the east, central Colombia to the south, and to the northwest it has been taken at Paya and at Rio Tacarcuna (approximately 7° 55′ N, 77° 20′ W), Darien, Panama and further exploration in Darien will no doubt extend the range much nearer the Canal Zone (fig. 24).

Mr. Gordon Small, who has collected repeatedly at Cerro Campana, Panama, and knows the fauna of this interesting locality well, informs me (personal communication) that at Cerro Campana *melantho* is not common, but that about 90% of the individuals are typical — the others "approximate *aedesia.*" He sent me two specimens of this second kind of *melantho*: they are hybrids of *melantho/aedesia* and with another hybrid specimen from Rio Trinidad, Panama, in the American Museum collection, are described below.

The male genitalia of *aedesia* (fig. 18) are characterized by the apex of the right valve being produced as a flared projection with its tip squared; the width of the tip of this projection is much greater than the length of the homologous projection in the other species. The left valve has an even larger flared projection at its apex, whereas in the other species the projection on the left valve is little larger than that of the right valve. In subspecies *melantho* these apical projections are a very little larger than they are in the nominate subspecies.

Xanthocleis aedesia melantho (Bates) (Figs. 23, 25)

Thyridia melantho Bates, 1866: 50 (Panama). Butler & Druce, 1874: 331. Godman & Salvin, 1879 [1879-1901]: 17; pl. 1, fig. 4. Schatz, 1885 [1885-1892]: pl. 10; 1886: 17. Haase, 1893: 53. Godman, 1901 [*in* Godman & Salvin, 1879-1901]: 642. Fountaine, 1913: 195. Riley & Gabriel, 1925: 33.

Aprotopos melantho, Kirby, 1871: 20. Staudinger, 1884 [1884-1888]: 56; pl. 27. Haensch, 1909: 127; pl. 34c.

America: open circles, *X. a. aedesia* (Doubleday & Hewitson); solid triangles, *X. ceto* (C. E. R. Felder); open triangles, *X. p. psidii* (Linné); solid squares, *X. p. ino* (C. & R. Felder); solid circles, *X. h. hippodamia* (Fabricius); open squares, *X. h. cetoides* (Rosenberg & Talbot).

Xanthocleis melantho, Bryk, 1937: 499. Fox, 1940: 181. d'Almeida, 1945: 97, 106-107; pl. 1, figs. 4, 10, pl. 3, fig. 8.
=*Aprotopos melantho randolis* Haensch, 1909: 127 (Chiriqui).
Xanthocleis melantho randolis, Bryk, 1937: 499. d'Almeida, 1945: 107-108.

The type of *melantho* is in the British Museum (Natural History), a male from Panama numbered 7114. The type of *randolis* is in the Berlin Museum. The latter is an aberration with the apical part of the hindwing between the border and the discocellular spot smeared with black scaling; it occurs throughout the range of the subspecies.

Three hybrid males of *melantho/aedesia* have come to my attention, all from the extremity of the range of *melantho,* just west of the Panama Canal, and all combining the pattern peculiarities of the two subspecies. The arrangement of the black marking on the upper side is like *aedesia,* with the base of the forewing covered by a light triangle. This triangle, as well as the disc of the hindwing, is colored red-brown as in *melantho* rather than yellow brown as in *aedesia.* The subapical light patch on the forewing is translucent whitish-yellow as in *melantho,* not brownish yellow as in *aedesia.* The light spot near the anal angle of the forewing and the one in the end of the discal cell are partly yellow brown like *aedesia* and partly whitish yellow like *melantho.* On the under sides, the hybrid specimens have the large, strong white submarginal spots of *melantho* rather than the small, partially obsolete series of *aedesia.* One of them has the black discocellular spot connected to the border by a black line over M_3, a variant sometimes present in *melantho*; the other two more nearly resemble *aedesia* in that the border and spot approach each other along Cu_1, and one of them has the disc extensively scaled with yellow beyond the spot. All have the long costal streak on the hindwing, shaped as in *aedesia* but colored reddish brown rather than yellow brown; in *melantho* this streak is much smaller than in *aedesia,* but is reddish brown.

As noted, the hybrid specimens seen were all males, one from Rio Trinidad, Panama (AMNH), two from Cerro Campana, Panama (G. Small).

Typical specimens examined, 124 ♂, 64 ♀:

GUATEMALA: Alta Verapaz, Cuidad Guatemala, Quirigua, Tamahú, Guatemala, 30 ♂ 19 ♀ (AMNH, BM, CM, JHM, RM).

HONDURAS: San Pedro Sula, Honduras, 6 ♂ 1 ♀ (BM, CM, RM, ZSB).

NICARAGUA: Chontales, Edén, Nicaragua, 7 ♂ 3 ♀ (AMNH, BM, CM).

COSTA RICA: Rio Banana, Hacienda la Esperanza, Guápiles, Juan Viñas, Pozo Azul, Puerto Limón, Puntarenas, El Rodeo, San José, Rio Sixaola, Turrialba, Zent, Costa Rica, 44 ♂ 19 ♀ (AMNH, BM, CM, HR, MCZ, USNM).

PANAMA: Bajo Boquete, Bugaba, Isla Cébaco, Cerro Campana, Chiriquí, Potrerillos, Veraguas, "Colombia" (old labels), Panama, 32 ♂ 20 ♀ (AMNH, BM, CM, HR, MCZ, PM, G. Small, USNM, ZSB).

NO DATA: 5 ♂ 2 ♀ (AMNH, BM, CM, RM, USNM).

Xanthocleis aedesia aedesia (Doubleday & Hewitson) (Figs. 11-18, 24, 27)

Thyridia aedesia Doubleday & Hewitson, 1847 [1846-1852]: 118; pl. 16, fig. 4 (Venezuela). Lucas [1857]: 73; text fig. 165. Herrich-Schaeffer, 1864 [1864-1865]: 175. Godman & Salvin, 1880: 121. Haase, 1893: 53. Poujade, 1895: 141. Godman & Salvin, 1898: 108. Riley & Gabriel, 1925: 5.

Aprotopos aedesia, Kirby, 1871: 19. Scudder, 1875: 117. Staudinger, 1885 [1884-1888]: 57. Haensch, 1909: 127. Kremky, 1925: 200; fig. 53, 55. Forbes, 1942: 29.

Xanthocleis aedesia, Boisduval, 1870: 30. Scudder, 1875: 288. Weymer, 1890: 9, 17, 33. Bryk, 1937: 498. Fox, 1940: 181; pl..8, fig. 57. d'Almeida, 1945: 97, 105-106; pl. 1, figs. 5, 8, 12, pl. 2, figs. 10, 11, pl. 3, fig. 1. Fox & Fox, 1947: 174. Beebe, 1950: 60.

The holo- and allotype are in British Museum (Natural History), numbered 7102 and 7103, both from "Venezuela".

As in most butterflies, there is variation both in coloring and in pattern. In some individuals the black spot at the end of the hindwing cell is connected to the border by a black bar over M_3, suggesting the cross bar found in *psidii.*

Specimens examined: 239 ♂, 244 ♀:

PANAMA: Paya, Rio Tacarcuna (Darien, 7° 55′ N, 77° 20′ W), 3 ♂ (PM, G. Small).

COLOMBIA: **Bolivar:** Bolívar, 3 ♂ 4 ♀ (AMNH). **Magdalena:** Don Amo, Don Diego, Manaure, Minca, Onaca, Santa Marta, Ciénaga de Zapatoza (as "Lake Sapatoza"), 6 ♂ 7 ♀ (BM, CM, PM). **Antioquia:** Carare, Rio Cocorná, Mesopotamia, 1 ♂ 4 ♀ (AMNH, BM). **Santander:** Quebrada Armas, Cazabe, Landázuri, Rio Minero, 18 ♂ 12 ♀ (AMNH, CM, CAS, JHM). **Boyacá:** Muzo, Rio Opón, 15 ♂ 22 ♀ (AMNH, BM, CM, RM, ZSB). **Caldas:** Itaburi (near Pueblo Rica), Quebrada Mumbú, 3 ♂ (AMNH, CM). **Valle de Cauca:** Cali, Espejuelo (near Cali), Santa Rita, Torne (?), 12 ♂ 3 ♀ (AMNH, BM). **Cauca:** Juntas, 2 ♂ 2 ♀ (BM). **Tolima:** Rio Chilí, Purnio, Quindío, Tolima, 8 ♂ 17 ♀ (BM, CM, RM). **Cundinamarca:** mountains near Bogotá, Cananche (?), Choachí, Guadalite (?), 8 ♂ 11 ♀ (BM, CM, RM). **Huila:** Neiva, 1 ♂ 4 ♀ (RM). **Not located:** Honda (which ?), 5 ♂ 2 ♀ (BM); Parvenir, 1 ♀

(AMNH): San Juan de Córdoba, 1 ♂ (PM). Vague: Bogotá, Interior, Colombia, 48 ♂ 46 ♀ (AMNH, BM, CM, MCZ, PM, RM, USNM, ZSB).

VENEZUELA: **Mérida:** Mérida, 7 ♂ 4 ♀ (AMNH, BM). **Falcón:** Rio Aroa, Laguinita de Aroa, Pueblo Nuevo, 11 ♂ 4 ♀ (CM, USNM), **Portuguesa:** Cortado del Guayabo, 2 ♀ (JHM). **Carabobo:** Maracay, Las Quiguas, San Esteban, 31 ♂ 49 ♀ (BM, CM, JHM, ZSB). **Aragua:** Edo, Pie del Cerro, Rancho Grande, 1 ♂ 12 ♀ (CM, JHM). **Dist. Federal:** Berg Avila (?), Caracas, La Guaira, El Junquito, El Limón, Los Venados, 5 ♂ 11 ♀ (BM, CM, JHM, MCZ, RM, USNM, ZSB). **Sucre:** El Valle, 1 ♀ (USNM). **Not located:** Macatoni, 1 ♂ 1 ♀ (BM); El Mene de la Costa, 1 ♂ (BM). Vague: Venezuela, 20 ♂ 13 ♀ (BM, CM, MCZ, PM, RM, USNM).

GUYANA: Warani (error ?), 1 ♂ (RM).

BRAZIL: **Amazonas:** São Gabriel (Rio Uaupés), 1 ♂ (RM). Vague: Brazil, 1 ♂ (AMNH).

ERRORS: Ecuador, 1 ♂ 1 ♀ (BM); Peru, 1 ♂ (CM); northeastern Peru, 4 ♂ 1 ♀ (AMNH); Pará (Brazil), 1 ♂ 1 ♀ (PM, RM); Cochabamba (Bolivia), 1 ♀ (RM); Bolivia, 2 ♂ (RM).

NO DATA: 16 ♂ 8 ♀ (BM, CM, MCZ, PM, USNM).

Xanthocleis ceto

This is an exceedingly rare inhabitant of the Andean forests. Of the seven specimens seen, only the male from Venezuela in the Munich collection and the female from eastern Ecuador in Carnegie Museum bear exact localities. The other labels, though vague, serve to link these two geographic extremes.

Externally, the long toothed extension of the forewing cross bar over the proximal half of M_3 is diagnostic.

Xanthocleis ceto (C. & R. Felder) (Figs. 19, 24, 28)

Thyridia ceto C. & R. Felder, 1865 [1864-1867]: 353 (Bogota). Hoppfer, 1869: 451. Sharpe, 1890: 559.

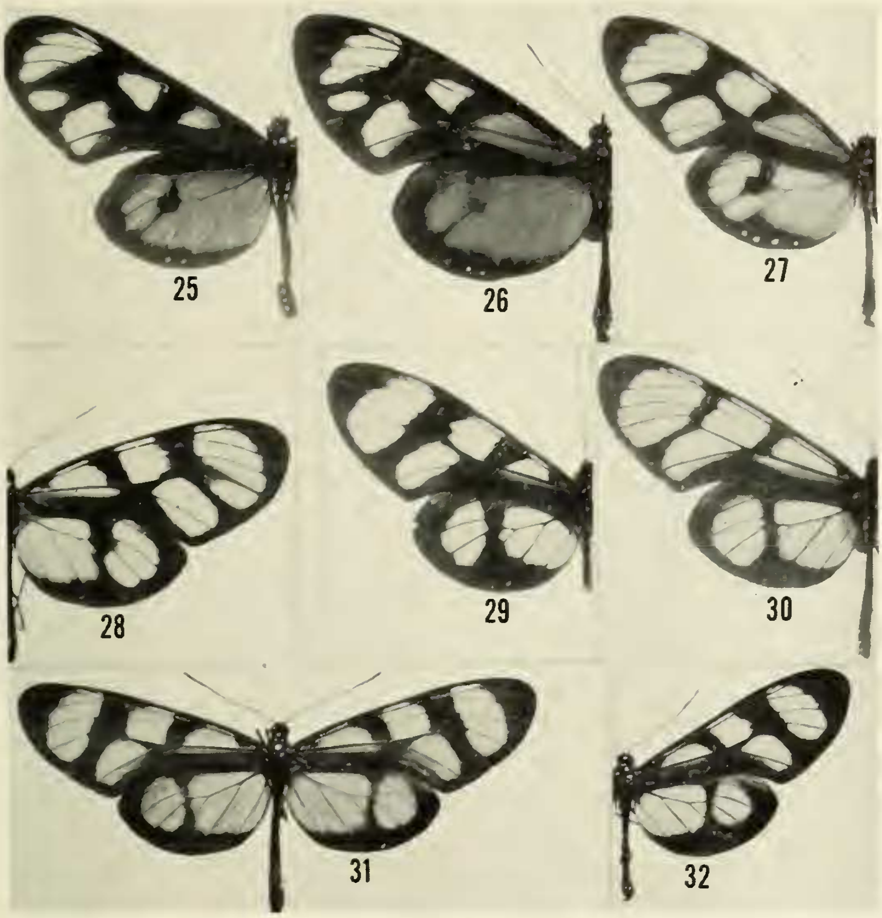
Aprotopos ceto, Kirby, 1871: 10. Staudinger, 1885 [1884-1888]: 57. Haensch, 1909: 127.

Xanthocleis ceto, Bryk, 1937: 498. Fox, 1940: 181. d'Almeida, 1945: 108.

=*Thyridia colombiana* Godman & Salvin, 1898: 108 (Rio Meta, Colombia). Riley & Gabriel, 1925: 13. d'Almeida, 1945: 108.

The type of *ceto* is a male from "Bogota", numbered 18123; the type of *colombiana* is a female from Rio Meta, Colombia, numbered 7112; both are in the British Museum (Natural History).

The male genitalia are closest to those of *aedesia,* though not so



Figs. 25-32. Fig. 25. *X. a. melantho* (Bates), ♂, Tamahu, Guatemala, CM. Fig. 26, hybrid of *melantho* and *aedesia*, ♂. Cerro Campana, Panama, G. B. Small collection. Fig. 27, *X. a. aedesia* (Doubleday & Hewitson), ♂, San Esteban, Carabobo, Venezuela, CM. Fig. 28, *X. ceto* (C. & R. Felder), (holotype ♀ of *Thyridia columbiana* Godman & Salvin), Rio Metá, Colombia, BM. Fig. 29. *X. p. psidii* (Linné), ♂, Arabapó, Bolívar, Venezuela, CM. Fig. 30, *X. p. ino* (C. & R. Felder), ♂, Satipo, Junín, Peru, CM. Fig. 31, *X. h. hippodamia* (Fabricius) (holotype ♂ of *Thyridia pallida* Godman & Salvin), Chapada, Mato Grosso, Brazil. Fig. 32, *X. h. cetoides* (Rosenberg & Talbot), holotype ♂, Pozuzo, Huánuco, Peru, BM. Natural size.

massive and the projections of the valves are different; that of the right valve has the flat end placed obliquely and that of the left is squared at the end but is not so strongly flared as in *aedesia.*

Specimens examined: 3 ♂, 4 ♀:

Venezuela: **Dept. Federal:** Berg Avila, 1 ♂ (ZSB).

Colombia: **Metá:** Rio Metá, 1 ♀ (BM). **Vague:** Bogota, Interior of Colombia, 2 ♂ 1 ♀ (BM).

Ecuador: **Oriente:** Rio Cotapina, 1 ♀ (CM).

Brazil: **Amazonas:** São Paulo [de Olivençia], 1 ♀ (CM).

Xanthocleis psidii

There are two subspecies: *X. p. psidii* occurs (fig. 24) in the Guianas and lower and middle Amazon valley, *X. p. ino* in the Andean valleys from central Colombia to Bolivia, thence eastward in the upper Amazon, southwestern Brazil and northern Argentina. Ménétriés (1855) recorded *psidii* from Hispanola, an error as Hall (1925) suspected. Beizanko (1960a) records "psidii" — undoubtedly *psidii ino* — from Missiones Territory and this probably is the southeastern corner of the range. While the differences between the two subspecies are not great, typical examples of each are readily recognized. Intergrading individuals are found where the distributional areas of the respective subspecies meet and in such places there is, no doubt, interbreeding. For this reason d'Almeida (1945) called them "weak subspecies". The macular peculiarities of each are consistent, except along the common frontiers, giving a geographic correlation entirely sufficient to satisfy the concept of subspecies.

d'Almeida (1945) assigned *Thyridia pytho* Felder as a third subspecies, but examination of the holotype demonstrates beyond doubt that *pytho* is an absolute synonym for *hippodamia* Fabricius, as noted by Haensch (1909). I have not been able to find among the extensive collections at my disposal any form of *psidii* in southeastern Brazil.

The rather pointed apical projection on the left valve of the male (fig. 20) serves to separate *psidii.* This projection may be folded inward and forward so that each genitalic preparation has its own peculiar appearance, unless precautions are taken during mounting or allowance for perspective is made during examination.

Xanthocleis psidii psidii (Linné) (Figs. 20, 24, 29)

Papilio psidii Linné, 1758: 466. Müller, 1774: 585. Fabricius, 1775: 462. 1781: 30. Meerburgh, 1789: pl. 24. Gmelin, 1790: 2254. Herbst, 1790: 187. Fabricius, 1793: 169 (part). Rudolphi, 1804: 9.

Thyridia psidii, Hübner, 1816 [1816-1826]: 9 (part). Doubleday, 1847 [1846-1852]: 118 (part). Ménétriés, 1855: 19 (part). Herrich-Schaeffer, 1864: 175. Butler, 1869: 128. Kirby, 1870: 139. 1871: 19. Möschler, 1876: 310. Kaye, 1905: 85, 120. Poulton, 1908: 7, 8-11.

Xanthocleis psidii, Boisduval, 1870: 30. Aurivillius, 1882: 45; pl. 1, fig. 1. Bryk, 1937: 499-500. Fox, 1940: 207; pl. 8, fig. 57. d'Almeida, 1945: 97, 99-101; pl. 2, figs. 3, 4, 8, pl. 3, fig. 9.

Aprotopos psidii, Haensch, 1903: 168. 1909: 127; pl. 34c. Hall, 1925: 165. Hering, 1926: 321. Ribeiro, 1931: 43. Lima, 1936: 209. d'Almeida, 1937: 251.

=*Thyridia ino,* Bates (not Felder), 1862: 519.

=*Aprotopos pytho,* Staudinger, (part) (not Felder), 1885 [1884-1888]: 57.

The type, in Museum Ludovicae Ulricae, Stockholm, was figured by Aurivillius (1882).

Specimens examined: 75 ♂, 15 ♀:

Venezuela: **Bolívar:** Arabapó (as "Arabupu"), 1 ♂ 1 ♀ (CM).

Surinam: Aroewarwa Kreek, Gelderland, Marowijne Rivier, Paramaribo, Saramacca Rivier, Surinam, Dutch Guiana, 19 ♂ 3 ♀ (AMNH, BM, CM, PM, USNM).

French Guiana: Cottica, Riviére Maroni, St. Jean, St. Laurent, French Guiana, 26 ♂ 6 ♀ (AMNH, BM, PM, RM, USNM).

Brazil: **Amazonas:** Rio Negro, Santo Antonio do Javary (8° 30′ S, 65° 30′ W), 2 ♂ (BM). **Pará:** Rio Cupari, Itaituba, Obidos, Rio Topajós, 7 ♂ 2 ♀ (BM, MCZ). **Amapá:** Bragança, 1 ♀ (USNM). **Guaporé:** Abuña, Allança, Calama, Humaytá, Jutahy (Rio Madeira; as "Jutahy, Goyez"), 8 ♂ 2 ♀ (BM). **Not located:** Onoribo, 1 ♂ (BM). **Vague:** Amazons, Brazil, 7 ♂ (BM, MCZ, PM, USNM).

No Data: 4 ♂ (PM, RM, USNM).

Xanthocleis psidii ino (C. & R. Felder) (Figs. 24, 30)

Thyridia ino C. & R. Felder, 1862: 75 (Upper Rio Negro). Herrich-Schaeffer, 1864: 175. Druce, 1876: 206. Haase, 1893: 53.

Aprotopos ino, Kirby, 1871: 20. Staudinger, 1885 [1884-1888]: 57 (part). Haensch, 1909: 127.

Xanthocleis ino, Bryk, 1937: 500. Fox, 1940: 181. d'Almeida, 1945: 97, 100: pl. 1, figs. 1, 7, 11, pl. 3, fig. 6.

=*Aprotopos psidii,* Haensch (not Linné), 1903: 168 (part).

= *Xanthocleis psidii,* Biezanko (not Linné), 1960a: 4. 1960b: 4.

The holotype is a male numbered 18118 in British Museum (Natural History) via the Rothschild collection; the locality label reads "Rio Negro, Brazil". A number of Felder names were recorded from this station, which has generally been interpreted to be the large river flowing into the Amazon at Manáos. Michael Clifton, of the British Museum, has demonstrated to my complete satisfaction (personal communication) that the locality where the Felder types were collected was in fact the Rio Negro in what is now Loreto, Peru, at approximately 6° S, 73° W; Clifton will detail his findings in a paper presently in preparation.

The more delicate, thinner black markings separate this from *psidii psidii* though the two subspecies are rather similar. d'Almeida (1945) viewed *psidii* and *ino* as "weak subspecies", but the very extensive material I have seen demonstrates the consistency and geographic correlation of the differences, such as they are.

Specimens examined: 256 ♂ 69 ♀:

Colombia: **Huila:** Neiva, 4 ♂ (RM). **Metá:** Acacías, Rio Guayuriba, Villavicençio, 4 ♂ 1 ♀ (AMNH, BM, CAS, ZSB). **Caquetá:** Rio Caquetá, Rio Ortegazua, 10 ♂ (AMNH, BM, CM). **Putumayo:** Puerto Limón, Rio San Vicente, 1 ♂ 1 ♀ (AMNH, USNM). **Amazonas:** Caucayá, Rio Tacaná, 7 ♂ (AMNH, CM). **Vague:** Bogotá, Colombia, Interior, 14 ♂ 1 ♀ (BM, MCZ, USNM).

Ecuador: **Oriente:** Aquanacú (as "Aquano"), Archidona, Bambay (?), Rio Cotopina (?), Rio Margarjitas, Mera, Rio Napo, Puyo, Rio Topo, 7 ♂ 3 ♀ (AMNH, BM, CM). **Error:** Ambato (see Brown, 1941), 1 ♂ (BM). **Vague:** Ecuador and Oriente, 1 ♂ 1 ♀ (AMNH).

Peru: **Amazonas:** Ponaya (as "Poynyo"), 1 ♂ (BM). **Loreto:** Achinamiza, Caballacocha, Rio Cachien (near Iquitos), Chambireyacu (near Yurimaguas), Fimber (Rio Samán), Iquitos, lower Rio Napo, Rio Pacaya, Pébas, Pucallpa, Rio Ucayali, Lago Yarina-Cocha, 43 ♂ 2 ♀ (AMNH, BM, CM, PM, RM, ZSB). **San Martín:** Juanjui, 8 ♂ 5 ♀ (AMNH, CM, RM). **Huánuco:** Pozuzo, Tingo María, 9 ♂ 2 ♀ (AMNH, BM, CM). **Junín:** La Merced, La Oroya, Puerto Bermúdez, Satipo, 46 ♂ 1 ♀ (BM, CM, ZSB). **Cusco:** Rio Chanchosmayo, Cosñipata, Marcapata, 5 ♂ 5 ♀ (BM). **Madre de Dios:** Rio Inambari, Sheringayoc (near Puerto Maldonado), 4 ♀ (BM, ZSB). **Puno:** Rio Huacamayo, La Pampa, La Unión, 18 ♂, 1 ♀ (BM). **Not located:** La Salud, 1 ♀ (JHM). **Vague:** Southeastern Peru, Peru, 4 ♂ (BM, CM, USNM).

Brazil: **Amazonas:** Rio Madeira, Rio Purús, São Paulo de Olivençia, Tabatinga, Amazons, Amazon valley, 13 ♂ 5 ♀ (BM, CM, PM, ZSB). **Guapore:** Puerto Velho (error ?), 1 ♂ (CM). **Vague:** Brazil, 1 ♀ (AMNH).

BOLIVIA: **Pando:** Chive, 3 ♂ (PM). **La Paz:** Ixiamas, Rio Mapiri, La Paz, San Carlos (Rio Mapiri), Yungas de Palmar, 2 ♂ 4 ♀ (PM, USNM, ZSB). **Cochabamba:** Rio Chipiriri, Cochabamba, Palmar, Todos Santos, Yunga (Rio Espíritu Santo), Los Yungas, 16 ♂ 10 ♀ (BM, JHM, PM, ZSB). **Beni:** Espíritu, Reyes, 2 ♂ 10 ♀ (BM, ZSB). **Santa Cruz:** Buena Vista, Sára, Rio Surutu, Rio Yapacani, 10 ♂ 7 ♀ (BM, CM). **Vague:** "8 days north of Cochabamba", Bolivia, 3 ♂ (BM, MCZ).

ARGENTINA: **Jujuy:** Yuto, 2 ♂ (ZSB). **Salta:** Calimonte, 1 ♂ (ZSB). **Tucumán:** Sierra de Aconquija, Tucumán, 3 ♂ 2 ♀ (BM, ZSB).

NOT FOUND: Taurbo, 1 ♂ (PM).

ERRORS: Guadalajara, Mexico, 10 ♂ 1 ♀ (MCZ); Guatemala, 1 ♀ (AMNH); British Guiana, 1 ♂ (BM); Santarém, Brazil, 2 ♂ (CM, MCZ); Santa Catarina, Brazil, 3 ♂ (BM, USNM); Bahia, Brazil, 1 ♂ (CM).

NO DATA: 2 ♂ (CM, USNM).

Xanthocleis hippodamia

Of the two subspecies, the nominate occurs in southeastern Brazil in several color variants which evidently are not geographically correlated. *X. h. cetoides* is so far known only from two localities; the type series was taken at Puzzuzo, central Peru, and another four males in the British Museum are ticketed from São Paulo de Olivençia. The latter locality is, however, suspect as it was at one time a gathering point for specimens for sale to tourists and travelling naturalists; it is quite possible that these males really were captured many miles up the Amazon system in Peru. On the other hand, *hippodamia* is not an especially common species and accurate locality records are meager; both subspecies may well be more widely distributed than the presently available data indicates.

The male genitalia are similar to those of *psidii* in having the relatively shorter penis, but differ in the rounded, not pointed tip of the left valve and the squared, not rounded tip of the right valve.

Externally, *hippodamia* differs from *psidii* by having the translucent areas of the wings clouded with white, yellow or brown scaling or with some combination of these colors, and the forewing cross bar of both species differs from that of *ceto*.

Xanthocleis hippodamia hippodamia (Fabricius) (Figs. 21, 22, 24, 31)

Papilio hippodamia Fabricius, 1775: 461 (No locality cited). 1781, 2: 29. 1787: 14. Gmelin, 1790: 2250. Herbst, 1790: 174. Fabricius, 1793, 3(1): 165.

Heliconia hippodamia, Latreille, 1819: 212.

Ithomia hippodamia, Doubleday, 1847 [1846-1852]: 125.

Thyridia hippodamia, Butler, 1869: 127; pl. 1, fig. 1. Kirby, 1871: 640. Poulton, 1908: 11.

Aprotopos hippodamia, Haensch, 1909: 127. Kremky, 1925: 201; figs. 54, 56, 57, pl. 23, fig. 1. Zikan, 1935: 73.

Xanthocleis hippodamia, Bryk, 1937: 499. Fox, 1940: 181. d'Almeida, 1945: 97, 102-104; pl. 2, figs. 5, 6, 9, pl. 3, fig. 4. Bryk, 1953: 32. d'Almeida, 1956: 5.

= *Thyridia pytho* C. & R. Felder, 1860: 102 (Bahia). Bates, 1862: 520. Herrich-Schaeffer, 1864: 175. Haase, 1893: 53.

Aprotopos pytho, Kirby, 1871: 20. Staudinger, 1885 [1884-1888]: 57. Haensch, 1909: 127 (as a synonym for *hippodamia*).

Xanthocleis pytho, Bryk, 1937: 499. d'Almeida, 1945: 97, 101-102; pl. 2, figs. 1, 2, 7, pl. 3, figs. 2, 3, 7.

= *Thyridia pallida* Godman & Salvin, 1898: 109 (Chapada, Mato Grosso). Poulton, 1908: 11. Riley & Gabriel, 1925: 37.

Aprotopos pallida, Haensch, 1909: 127. Zikan, 1935: 73.

Xanthocleis pallida, Bryk, 1937: 499. Fox, 1940: 181. d'Almeida, 1945: 97, 101-102.

[*Aprotopos hippodamia* ab. "simplicior" Röber, 1930: 19 (São Paulo).]

= *Aprotopos simplicior* Zikan, 1935: 73, 74.

Xanthocleis simplicior, Bryk, 1937: 500. Fox, 1940: 181. d'Almeida, 1945: 97, 103-105; pl. 1, figs. 2, 6, 9, pl. 3, fig. 5.

[*Xanthocleis hippodamia hippodamia* "posticapura" Bryk, 1953: 32 (No locality cited).] d'Almeida, 1956: 5.

I have been unable to locate the original type of *hippodamia.* The specimen figured by Butler (1869) as the type is not a Fabrician specimen but one purchased by the British Museum in 1847. Because this was the first published illustration of *hippodamia* and because the original description was too ambiguous for precise identification, Butler's interpretation of the name has been universally accepted. In order to stabilize the use of *hippodamia* Fabricius in this generally understood sense, the specimen figured by Butler (1869) and in the British Museum (Natural History) is hereby designated the neotype.

The holotype of *pytho,* a male from Bahia, Brazil, is now in the British Museum (Natural History) via the Rothschild collection and is numbered 18120 in the type collection; the genitalia are mounted on slide 1333j, prepared by Jean W. Fox in 1965.

The holotype male and seven male paratypes of *pallida,* all from Chapada, Mato Grosso, Brazil, are also in the British Museum, numbers 7104 to 7111; the genitalia of the holotype are on slide 1210j and those of a paratype on slide 1205j, both prepared by Jean W. Fox in 1965.

I have not seen the type of *simplicior*, but there is no doubt as to its identity. Improperly proposed as an aberration, the name was validated by Zikan (1935). The type of "posticapura" was loaned me by the Swedish Museum of Natural History, Stockholm; even if the name had been properly proposed, it would have been entirely unnecessary.

d'Almeida (1945) tentatively presented *simplicior* as a subspecies of *hippodamia*, at the same time expressing his belief that further locality data would show that *simplicior* is only an individual color variant and therefore a synonym. When his locality records were combined with those at hand, it immediately became evident that the two forms are sympatric and, in view of the identical male genitalia, d'Almeida was entirely correct in his supposition. In the same study, he treated *pallida* and *pytho* as synonymous color variants.

When, in 1965, I found the holotype of *pytho* in the Rothschild collection, I was surprised to see that it is *hippodamia* (which the Felders did not know). Comparison of the male genitalia of the types of *hippodamia, pallida, pytho* and of a number of other specimens, including some bearing d'Almeida's identification as *simplicior*, demonstrates beyond doubt that *hippodamia* is an externally variable species, but nevertheless a morphologically homologous one. It appears that *psidii* is not represented in southeastern Brazil.

Specimens examined: 54 ♂ 38 ♀:

BRAZIL: **Pará**: Alcobaça, 1 ♂ (CM). **Mato Grosso**: Chapada, Rio Cuiubá, Nivac (?), 14 ♂ 2 ♀ (BM, USNM). **Goias**: Goias, 1 ♂ 2 ♀ (BM, ZSB). **Pernambuco**: Pernambuco, 1 ♂ (USNM). **Bahia**: Bahia, 4 ♂ 4 ♀ (BM, PM). **Minas Geraes**: Minas Geraes, 1 ♀ (ZSB). **Espírito Santo**: 2 ♀ (BM). **Guanabara**: Itabapoana, Jacarepagua, Mendes, Nictheroy, Rio de Janeiro, 11 ♂ 11 ♀ (BM, CM, MCZ, PM, ZSB). **São Paulo**: Anghugahy (?), Araçatuba, Littre (?), São Paulo, 6 ♂ 2 ♀ (AMNH, BM, MCZ, PM, USNM). **Paraná**: Maracaí, Ponta Grossa, 2 ♀ (BM, MCZ). **Santa Catarina**: Santa Catarina, 3 ♂ 2 ♀ (ZSB). **Vague**: "Bresil meridionale", Brazil, 6 ♂ 6 ♀ (BM, PM).

PARAGUAY: Supucay (near Villarica), 2 ♂ (RM).

ERRORS: Venezuela, 2 ♂ (MCZ, USNM); Surinam, 1 ♀ (AMNH); Cayenne, 1 ♀ (PM); Bogotá (Colombia), 1 ♂ (BM).

NO DATA: 2 ♂ 2 ♀ (BM, PM).

Xanthocleis hippodamia cetoides (Rosenberg & Talbot) (Figs. 24, 32)

Aprotopos ceto cetoides Rosenberg & Talbot, 1914: 671 (Pozuzo, Peru). Riley & Gabriel, 1925: 12.
Xanthocleis ceto cetoides, d'Almeida, 1945: 108-109.

British Museum (Natural History) has the male holotype (number 18122) and two male paratypes, all from Pozuzo, Peru. Genitalia of the holotype are mounted on slide 1332j, of a paratype on slide number 1209j, both prepared by Jean W. Fox.

Rosenberg and Talbot (1914) compared *cetoides* with *ceto,* thinking the two to be conspecific. d'Almeida (1945) did not know *cetoides* and followed the original authors. The smaller size of cetoides (33 mm. along one forewing, compared to 43 mm. in *ceto*) and the thin, narrow cross bar on the hindwing long ago suggested to me a relationship with *hippodamia*; when I at last was able to compare the male genitalia, I found them to be absolutely identical.

As previously noted, the four males labelled São Paulo de Olivençia may have come from much further up the Amazon Valley — perhaps from central Peru.

Specimens examined: 7 ♂:

PERU: Huanuco: Pozuzo, 3 ♂ (BM).
BRAZIL: Amazonas: São Paulo [de Olivençia] (error?), 4 ♂ (BM).

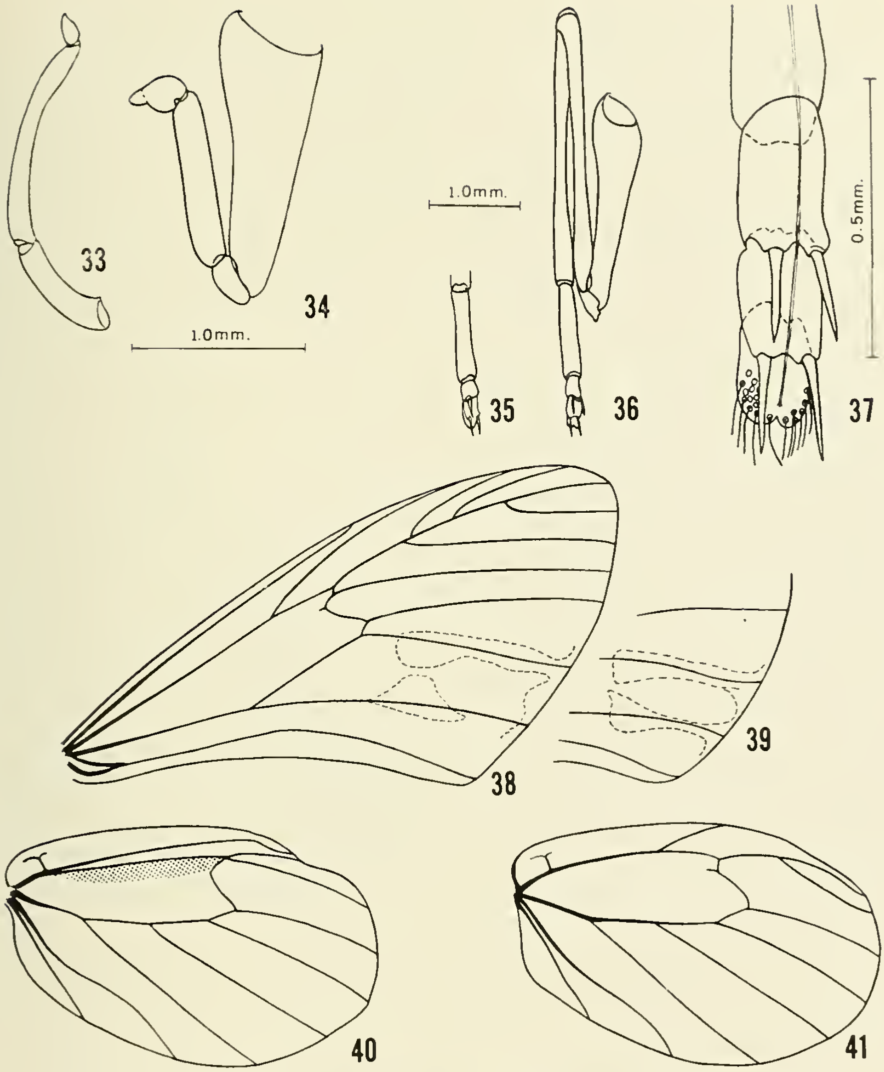
Genus **FORBESTRA** new genus

Type-species, *Papilio equicola* Stoll, 1780.

This genus is named in honor of Professor W. T. M. Forbes, who (1924) was the first to call attention to the differences separating *equicola* and allies from *polymnia* and allies. He noted the venational and male genitalic characters and the peculiar formation of certain pattern elements on the forewings. To these I add my observations on the female forelegs. Accordingly, *equicola* and allies are here removed from *Mechanitis* and *Forbestra* is erected to receive them.

Forbestra has the features of the Mechanitini as previously defined and those of *Mechanitis* except in the following respects:

Female forelegs (figs. 35-37). — in *Forbestra* the tarsal segments are thicker and heavier than those of *Mechanitis* and the first segment is more strongly widened at its tip; the second and third segments always bear a pair



Figs. 33-41, morphological characters of the genus *Forbestra*. Fig. 33, palpus; fig. 34, male foreleg: fig. 35, female foretarsus, all of *F. e. equicoloides* (Godman & Salvin); fig. 36, female foreleg of *F. truncata* (Butler), drawn to scales shown. Fig. 37, detail of female foretarsus of *F. truncata* (Butler), enlarged. Fig. 38, forewing of *F. e. equicoloides* (Godman & Salvin); fig. 39, anal angle of forewing of *F. t. juntana* (Haensch) with elements of the comma mark shown by dotted outlines; fig. 40, male hindwing; fig. 41, female hindwing of *F. e. equicoloides* (Godman & Salvin); all slightly more than twice natural size.

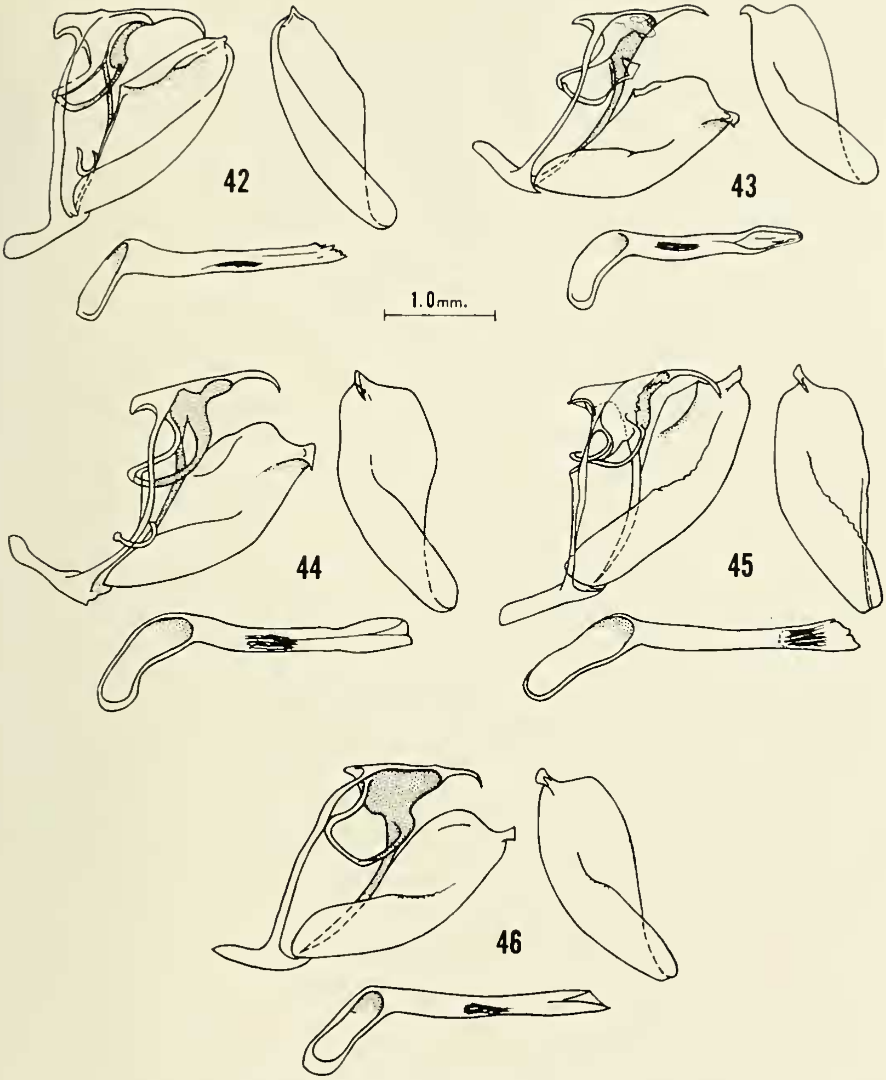
of spurs and there is a single spur (the inner) on the first tarsal segment of all species except *equicola*. In *Mechanitis* the first tarsal segment never bears a spur and the spurs on the second segment are variable.

Venation (figs. 38-41). — in *Forbestra* 1d of the forewing is never present and M_1 is stalked from R_s beyond the apex of the discal cell at a distance at least equal to the length of 3d; in *Mechanitis* 1d is frequently present, but when it is absent, M_1 is stalked from R_s at the cell apex or only a short distance beyond and never at a distance as great as the length of 3d. On the hindwing, males of *Forbestra* have 1d either absent or much shorter than one-fourth the length of 2d; in males of *Mechanitis* 1d is always present and is at least one-third the length of 2d. In females of *Forbestra* 1d is always absent and M_1 is stalked from R_s beyond the cell apex at a distance as long as or longer than the length of 2d; in females of *Mechanitis* 1d is often present, but when it is absent M_1 is stalked from R_s at the cell apex or at a distance beyond it always less than the length of 2d.

Pattern of wings. — the comma mark on the forewing of *Forbestra* is always formed from two black streaks placed respectively *over* Cu_1 and Cu_2 (fig. 39); these streaks are not present in *Mechanitis* and the comma marks of the two genera are not homologous. These two streaks in *Forbestra juntana* retain their primitive condition as two parallel black lines (fig. 39); in *F. equicola* they have a comma-like formation (fig. 48) — similar to but not the same as the comma mark of *Mechanitis*. In *Mechanitis* the comma mark, when it is not suffused in a black area and is separately visible, is formed by two elements in Cu_1-Cu_2: an intravenal black streak joined at its proximal end to a postmedial spot (fig. 65). A second striking difference is that in *Forbestra* there is a black spot in the base of the forewing cell, in addition to the one near the end of the cell; only the latter is present in *Mechanitis*. This basal cell spot is not always seen in an individual specimen: it usually is strong in *F. olivencia*, but sometimes is vestigial or even absent; it is vestigial or absent in *F. aeneola*; it is usually absent but sometimes vestigial in *F. truncata* and *F. equicola*. It is never found in *Mechanitis*.

Male genitalia (figs. 42-46). — in general structure they are similar to the other genera of the tribe, especially *Mechanitis* and *Sais*, but the valve of *Forbestra* is stouter and the apical projection is shorter and more compact than in *Mechanitis*.

Five species are known and all are relatively rare in collections. *F. equicola* is easily recognized by the distinctive pattern and for that reason is selected as type-species of the genus, but it stands apart from the other species in pattern, male genitalia and female forelegs and is, perhaps, not strictly "typical". *F. proceris* is apparently closely related to the following species, but the apical armature of the male valve is distinctive. *F. olivencia*, *F. truncata* and *F. aeneola* are easily confused and differ from each other only in minor respects,



Figs. 42-46, male genitalia of *Forbestra* species, the penis and dissected left valve shown separately, all drawn to the same scale. Fig. 42, *F. e. equicoloides* (Godman & Salvin) from Caucayá, Amazonas, Colombia; slide 777, CM. Fig. 43, *F. proceris* (Weymer) from "Upper Amazon"; slide 780, CM. Fig. 44, *F. aeneola* new species, holotype from Lago Yarina-Cocha, Loreto, Peru; slide 1198, CM. Fig. 45, *F. olivencia* (Bates) from Rio Putumayo, Colombia; slide 813, AMNH. Fig. 46, *F. t. truncata* (Butler) from "Upper Amazon"; slide 774, CM.

though they are unquestionably distinct species occupying the same territory. Of these, *F. aeneola* is the most easily separated by male genitalia and the pattern characteristics appear to be consistent, with little variation. Both *truncata* and *olivencia,* on the other hand, exhibit a range of variation in pattern and coloring which can be most misleading, as witness the several synonyms for *olivencia* and the difficulty all students of the group have had in correct identification.

Key to the Species of Forbestra by Male Genitalia

1. Valve with costal margin nearly straight; apical tooth short, straight and erect (fig. 42) .... *F. equicola* (Stoll)
   Valve with costal margin strongly sinuate 2
2. Distal part of penis (measured from tip to posterior end of foramen) 25% longer than tegumen plus uncus; apex of valve armed with a recurved tooth (fig. 43) .... *F. proceris* (Weymer)
   Distal part of penis 50% longer than tegumen plus uncus; apex of valve armed with a projection shaped like an axe head 3
3. Tip of projection on valve about as wide as the thickness of penis (fig. 44) .... *F. aeneola* new species
   Tip of projection on valve about half as wide as the thickness of penis 4
4. Costal margin of valve evenly curved from articulation to apex; apical projection placed at the apex itself (fig. 46) .... *F. truncata* (Butler)
   Costal margin from articulation to apex formed by two nearly straight lines and a concave arc; apical projection placed on the costal margin anterior of the apex (fig. 45) .... *F. olivencia* (Bates)

Key to Species and Subspecies of Forbestra

1. Hindwing discal cell with two round black spots .... (*equicola*) 2
   No round black spots in hindwing discal cell 3
2. Hindwing with the marginal spots widened and often fused with the postmedian band to form a black patch, but the discal spots small and separated by tawny wider than the proximal spot; when these bands are separate, Cu_1-Cu_2 of forewing with strong yellow and the spot in its base small or absent .... *F. e. equicola* (Stoll)
   Hindwing with marginal and postmedian bands always separated by tawny, but the discal spots usually much larger than the tawny separating them; Cu_1-Cu_2 of forewing with little or no yellow scaling and the spot in its base large .... *F. e. equicoloides* (Godman & Salvin)

3. Distal edge of postmedian fascia of forewing more or less evenly curved from costal margin to M_3, the apical black not forming a sharp pointed tooth in R-M_1 .... *F. proceris* (Weymer)
   Distal edge of forewing postmedian fascia zigzag, with a prominent proximally-pointed tooth formed in R-M_1 by the apical black 4
4. Postmedian fascia of forewing exactly concolorous with the tawny ground; apex above mostly black with a small tawny patch containing no yellow; hindwing postmedian band reduced, especially above, and the black margins thin and linear .... *F. aeneola* new species
   Postmedian fascia of forewing yellow, at least near the costa, or of a tawny color definitely paler than the ground; apex above broadly tawny or containing a yellow spot; hindwing postmedian and marginal bands often strong and wide 5
5. Ground color a rich mahogany; forewing postmedian fascia and distal part of discal cell clear yellow .... *F. t. truncata* (Butler)
   Ground color yellowish or orange tawny, never mahogany 6
6. Apex of forewing mostly black, containing a small yellow (sometimes tawny) spot; postmedian fascia, end of discal cell and sometimes base of Cu_1-Cu_2 clear yellow; underside of forewing apex with a black or rusty brown marginal band wide enough to encompass the white submarginal dots (fig. 56B) 7
   Apex of forewing mostly tawny, sometimes with limited yellow scaling; the black series bounding the distal side of the yellow or tawny postmedian fascia formed as elongated triangles which are often separated from one another; marginal line in apex of forewing beneath thin and linear, the white submarginal dots placed in the tawny area (fig. 56A) .... *F. olivencia* (Bates)
7. Forewing discocellular spots wholly or nearly separated, the yellow postmedian fascia wider than the upper discocellular spot and filling most of M_3-Cu_1; hindwing marginal band proximally sinuate, widened between the veins, and the element in M_3-Cu_1 at least 3 mm. wide .... *F. t. oiticicai* (d'Almeida)
   Forewing discocellular spots almost always fused or broadly joined, the yellow postmedian fascia narrower than the upper discocellular spot and filling only about half of M_3-Cu_1; hindwing margin usually thin and linear, at most only 2 mm. wide in M_3-Cu_1 in some females, though often with tiny triangular thickenings between the veins .... *F. t. juntana* (Haensch)

Forbestra equicola

The species is nowhere common. *F. e. equicola* is found in the Guianas south into the lower Amazon valley and *F. e. equicoloides* is the subspecies of the Andean area (fig. 47).

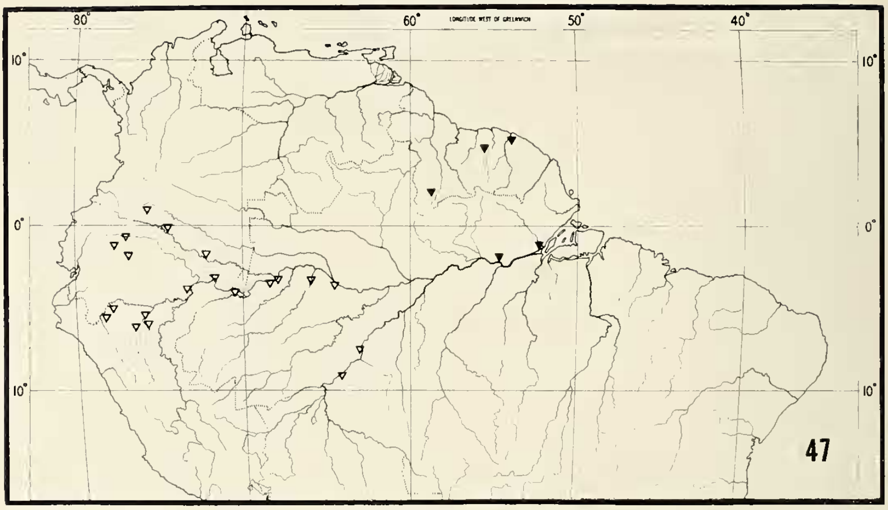


Fig. 47, South America: Solid triangles, distribution of *F. e. equicola* (Stoll); open triangles, *F. e. equicoloides* (Godman & Salvin).

Stoll's original figure was of a specimen with the postmedian and marginal black bands of the hindwing partly fused into a patch; this condition is not consistent, however, as a diagnostic character for separating the two subspecies. While it is true that the only specimens with fused hindwing bands that I have seen bear localities from the Guiana-Lower Amazon region, nevertheless some individuals of that population have the bands separated. The two subspecies are more reliably distinguished by the characteristics given in the key — the arrangement of yellow coloring on the forewing and the size of the black spot in the base of Cu_1-Cu_2 of the forewing.

Forbestra equicola equicola (Stoll) (Figs. 47, 48)

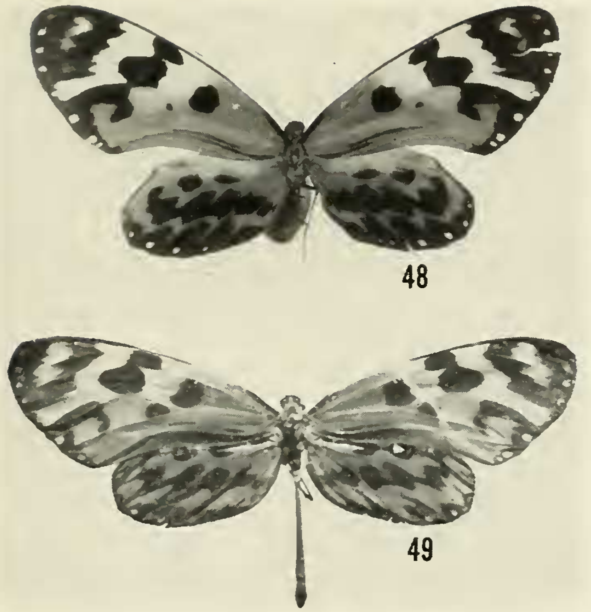
Papilio equicola Stoll, 1780 [*in* Cramer, 1775-1791], 4: 17; pl. 297 (Surinam). Herbst, 1790: 120; pl. 70, fig. 4.

Heliconia equicola, Latreille, 1820 [1819-1823]: 216.

Melinaea equicola, Bates, 1862: 551.

Mechanitis equicola, Kirby, 1871: 34. Staudinger, 1885 [1884-1888]: 71. Haensch, 1909: 124. Forbes, 1924: 146, 147, 148, 153. 1927: 28. Bryk, 1937: 485-486. d'Almeida, 1939: 81. Fox, 1940: 182. Forbes, 1948: 12.

=*Mechanitis sylvanoides* Godman & Salvin, 1898: 110 (Cayenne). Haensch, 1909: 125. Forbes, 1924: 148, 153. Riley & Gabriel, 1925: 46. Forbes, 1927: 28. Bryk, 1937: 486. d'Almeida, 1939: 81. Fox,



Figs. 48-49. Fig. 48, *F. e. equicola* (Stoll) ♂, Kuyuwini River, British Guiana, AMNH. Fig. 49, *F. e. equicoloides* (Godman & Salvin), holotype ♂, Cururai, Oriente, Ecuador, BM. Natural size.

1940: 182.
Mechanitis equicola equicoloides, Lichy, 1943: 209.

Apparently none of the Cramer or Stoll types are now in existence and the type of *equicola* cannot be found. A male in British Museum (Natural History) labelled "Interior Surinam, August 1892, C. W. Ellacombe; Rothschild bequest, B.M. 1939-1" is hereby designated as the neotype of *P. equicola* Stoll and is numbered 18442. The type series of *sylvanoides* is in British Museum (Natural History) numbered 7045 to 7247; the male holotype is from Cayenne.

Lichy (1943) recorded a female in the Anduze collection from Caripito, Venezuela (as *M. e. equicoloides*), and if the locality is authentic it represents the westerly extension of the range.

Specimens examined: 14 ♂, 3 ♀:

GUYANA: Kuyuwini River, British Guiana, 1 ♂ 1 ♀ (AMNH, BM).
SURINAM: Interior, 1 ♂ 1 ♀ (BM).
FRENCH GUIANA: St. Laurent, Cayenne, 5 ♂ 2 ♀ (BM, PM).
BRAZIL: Pará: Itaituba, Rio Muju, Obidos, 3 ♂ (BM, JHM, ZSB).
NO DATA: 1 ♂ (PM).

Forbestra equicola equicoloides (Godman & Salvin)
(Figs. 33-35, 38, 40, 41, 42, 47, 49)

Mechanitis equicoloides Godman & Salvin, 1898: 109-110. Haensch, 1909: 124-125; pl. 33e. Forbes, 1924: 146, 148, 153; pl. 12, fig. 8. Riley & Gabriel, 1925: 18. Forbes, 1927: 28. Aurivillius, 1929: 155. Bryk, 1937: 486. Fox, 1940: 182.

The type series is in British Museum (Natural History), seven males and three females numbered 7035 through 7044; the holotype is a male from Cururai, Ecuador, collected by Buckley, and paratypes are from São Paulo de Olivençia, Brazil, and Yurimaguas, Peru.

Specimens examined: 79 ♂, 20 ♀:

COLOMBIA: **Putumayo:** Mocoa, 1 ♂ (ZSB). **Amazonas:** Caucayá, Rio Putumayo, Rio Tacana, 13 ♂ 2 ♀ (AMNH, CM, MCZ, ZSB).

ECUADOR: **Oriente:** Rio Arajuno, Chimboraza, Cururai, Rio Napo, Puyo, 7 ♂ 1 ♀ (BM, CM, PM). **Vague:** Ecuador, 6 ♂ 2 ♀ (BM, CM).

PERU: **Amazonas:** Quebrada Huachinza, Rio Nievo, Pongo de Rentema, Rio Santiago, 5 ♂ (AMNH, BM, CM). **Loreto:** Achinamiza, Balsapuerto, Caballococha, Rio Cachiyacu (near Iquitos), Chimbireyacu (near Yurimaguas), Rio Huallaga, Iquitos, Rio Pacaya, Pebas, Rio Ucayali, Yurimaguas, 25 ♂ 14 ♀ (AMNH, BM, CM, PM).

BRAZIL: **Amazonas:** Humaytá (Rio Madeira), lower Rio Jurúa, São João (Rio Solimões), São Paulo de Olivençia, Teffé (Ega), Upper Amazon, 14 ♂ 1 ♀ (BM, CM, PM, ZSB). **Guaporé:** falls above Santo Antonio (Rio Madeira), 1 ♂ (BM).

ERRORS: Costa Rica, 1 ♂ (PM); Venezuela, 1 ♂ (MCZ); Bogota, 1 ♂ (BM).

NO DATA: 5 ♂ (AMNH, BM, PM).

Forbestra proceris

The species is distributed (fig. 50) in the valleys of the eastern Andes from southern Colombia to Peru, with little variation, either individually or geographically. Of all the species of *Forbestra, proceris* most resembles *Mechanitis*. Even the comma mark is *Mechanitis*-like at first glance, but on closer examination is seen to consist of the two streaks over the veins, the lower one having its distal half missing and its proximal half widened and connected to the upper streak. The shape of the forewing postmedian fascia and the comma mark serve to separate *proceris* from similar-appearing specimens of *F. t. juntana*.

Forbestra proceris (Weymer) (Figs. 43, 50, 51)

Mechanitis proceris Weymer, 1884: 12; pl. 1, fig. 2 (Tonatins, Brazil). Srnka, 1884: 297-298. Staudinger, 1885 [1884-1888]: 62. Haensch, 1909: 125. Forbes, 1924: 146, 147, 148, 153-154. Bryk, 1937: 497. Fox, 1940: 182. Forbes, 1948: 12, 13. d'Almeida, 1951: 7, 9, 12, 17.

The type is in the Berlin Museum.

Specimens examined, 91 ♂, 21 ♀:

COLOMBIA: Amazonas: Caucayá, Rio Tacana, 9 ♂ 2 ♀ (AMNH, CM). Vague: Colombia, 1 ♀ (MCZ).

ECUADOR: Oriente: Canelos, 1 ♂ (BM).

PERU: Loreto: Achinamiza, Rio "Ampyam" (Ampiyacu ?), Caballococha, Rio Cachiyacu (near Iquitos), Chimbireyacu (near Yurimaguas), Iquitos, Rio Marañon, lower Rio Napo, Pebas, Rio Ucayali, Yahuas territory, Yurimaguas, 42 ♂ 14 ♀ (AMNH, BM, CM, RM). Vague: Peru, 1 ♂ (BM).

BRAZIL: Amazonas: Sao João (Rio Solimões), São Paulo de Olivençia, Tonatins, 34 ♂ 2 ♀ (BM, CM). Vague: Amazonas, Upper Amazon, Brazil, 3 ♂ (BM, CM).

NO DATA: 1 ♂ 2 ♀ (AMNH, CM).

Forbestra aeneola

Heretofore unrecognized, this species has been mixed with *olivencia* and *juntana* in collections. One of the paratypes of *Mechanitis huallaga* Staudinger is *F. aeneola* and a male purchased from Staudinger, now in Carnegie Museum *via* the Academy of Natural Sciences of Philadelphia, bears Staudinger's identification as *M. huallaga*. The male genitalia and the wing pattern are both distinctive and readily recognized, once the related species are correctly sorted. The pattern and coloring of *F. aeneola* are remarkably consistent, exhibiting very little individual variation. Like *F. truncata* and *F. olivencia*, the distal edge of the postmedian fascia of the forewing is zigzag, but *aeneola* differs from those closely related species in that the tawny apical patch, the postmedian fascia and the basal area of the forewing are perfectly concolorous and in that the median band of the hindwing is absent or vestigial above.

The distribution of the 76 specimens seen is throughout eastern Peru from Iquitos to the Rio Madre de Dios, on the upper Rio Juruá and upper Rio Madeira in Brazil and in northwestern Bolivia (fig. 50).

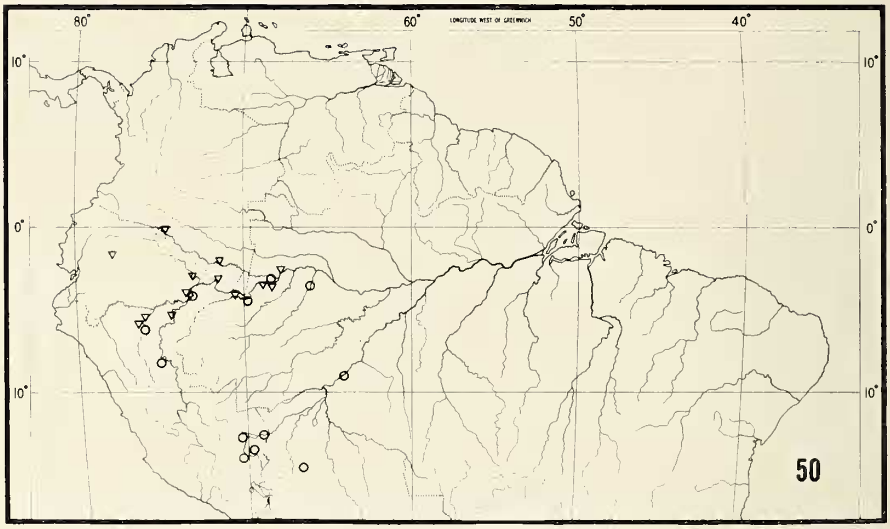
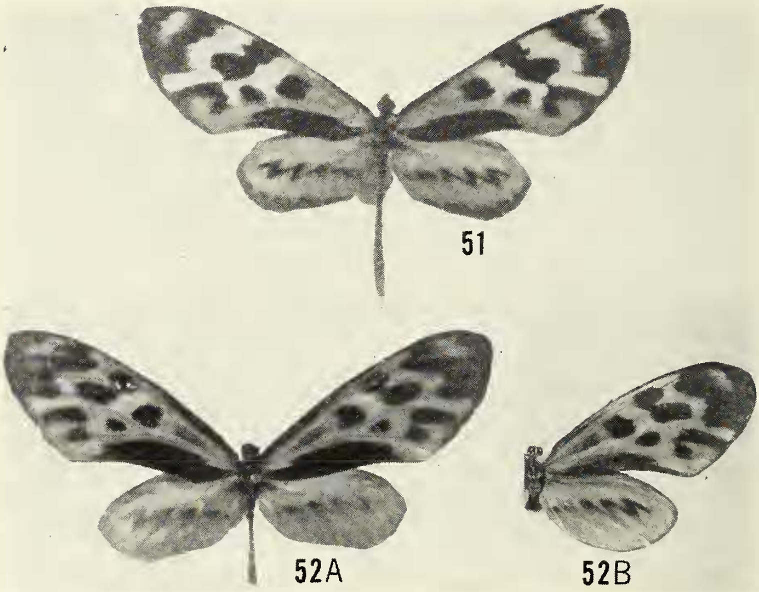


Fig. 50, South America: open triangles, distribution of *F. proceris* (Weymer); open circles, *F. aeneola* new species.



Figs. 51-52. Fig. 51, *F. proceris* (Weymer), ♂, Caucayá, Amazonas, Colombia, CM. Fig. 52, *F. aeneola* new species; fig. 52A, holotype ♂, Lago Yarina-Cocha, Loreto, Peru, CM; fig. 52B, allotype ♀, Iberia, Madre de Dios, Peru, AMNH. Natural size.

Forbestra aeneola new species (Figs. 44, 50, 52)

Male and female. Antennae brownish yellow, not darkened at the tips; in both *olivencia* and *juntana* the antennae are yellowish with dark tips. Body and legs do not differ from those of related species.

Both sides of both wings (fig. 52) evenly tawny and never with any yellow present. Forewing, upperside: the black spots bounding the distal side of the postmedian fascia fully fused and the entire apex is black with a small, irregularly shaped tawny spot within it and lying above M_1, and with narrow, streak-like traces of tawny scaling in M_1-M_2 and M_2-M_3 in many specimens; postmedian fascia tawny with no trace of yellow and exactly the same color as the basal part of the wing; comma mark composed of a black streak over Cu_1, its proximal end slightly or not at all connected with the proximal end of an oval black element over Cu_2; a quadrate black spot in the distal part of the discal cell and a streak-like spot in the base, often vestigial. On the underside, the apex is brassy-tawny, the black elements bounding the postmedian fascia being more reduced than above and their essentially triangular shape being evident; three to five white marginal dots present in apex and placed *within* the black border, which is widened in the apex but thin and linear on the rest of the distal margin; black streak in base of discal cell stronger than above. Hindwing with black borders thin and linear, unlike those of *olivencia,* which are wider and heavier; marginal dots not present above and on the underside absent in males and vestigial in females, generally indicated by thin, short black streaks; median band zigzag, being incomplete, vestigial or absent on the upperside but always stronger on the underside.

Male genitalia (fig. 44) are similar to those of *olivencia* and *truncata* and the projection at the apex of the valve has the same general shape, but in *aeneola* the tip of this projection is distinctly widened, being wider than the thickness of the penis, whereas in the other two species it is clearly narrower.

Holotype ♂: Lago Yarina-Cocha, Loreta, Peru; Hocking, 25-x-1959; genitalia slide 1198; in Carnegie Museum.

Allotype ♀: Iberia, Peru; Pallister, 29-iv-1947; in American Museum of Natural History.

Paratypes, 67 ♂, 7 ♀

PERU: **Loreto:** Iquitos, 1 ♂ 1 ♀ (ZSB), Lago Yarina-Cocha, 3 ♂ (CM), Yurimaguas (paratype of *M. huallaga* Staudinger), 1 ♂ (ZMH). **Junin:** Chuchuras, 1 ♂ (CU). **Cusco:** Quincemil, 1 ♂ (AMNH). **Madre de Dios:** Puerto Maldonado, 1 ♂ (AMNH), Sheringayac (near Puerto Maldonado), 1 ♂ (ZSB), Rio Madre de Dios, 6 ♂ 1 ♀ (CU). **Puno:** La Union (Rio Huancamayo), 31 ♂ 3 ♀ (BM) 1 ♂ (CM), Inca trail from Fort Union (La Unión) to Astillero, 4 ♂ (MCZ), Yahuaramayo, 7 ♂ (BM) 2 ♂ (CU).

BRAZIL: **Amazonas:** lower Rio Juréa, 1 ♂ (CM), São João (Rio Solimoes), 1 ♂ (BM), Tabatinga, 1 ♂ (BM). **Guaporé:** Falls above Santo Antonio (Rio Madeira), 1 ♂ 1 ♀ (BM). **Vague:** Upper Amazons, 1 ♂ (CM).

Bolivia: **Beni:** Reyes, 1 ♀ (BM).
Error: "Jal. Mex.", 2 ♂ (MCZ).

Forbestra olivencia

F. olivencia inhabits central and northern Peru, eastern Ecuador and the upper Amazon valley as far east as São Paulo de Olivençia (fig. 53). It is sympatric with *aeneola* and *juntana* in Peru and with *truncata* in the upper Amazon and so must be treated as a distinct species with, apparently, no subspecies.

Forbestra olivencia (Bates) (Figs. 45, 53, 54, 55, 56A)

Mechanitis polymnia olivencia Bates, 1862: 532 (São Paulo de Olivençia). Kirby, 1871: 24. Staudinger, 1885 [1884-1888]: 62. Weymer, 1899: 305. Haensch, 1905: 147; 1909: 125. Forbes, 1924: 146, 149. Bryk, 1937: 494-495. Fox, 1940: 182. d'Almeida, 1951: 6-7, 9, 12, 17. d'Almeida, 1960: 2.

=*Mechanitis huallaga* Staudinger, 1884 [1884-1888]: pl. 28: 1885: 62 (Jurimaguas, Peru). Haensch, 1903: 167. 1905: 147. 1909: 125; pl. 34a. Forbes, 1924: 146, 149: pl. 12, fig. 3. Bryk, 1937: 495. Fox, 1940: 182. Forbes, 1948: 13. d'Almeida, 1951: 7, 9, 17.

[*Mechanitis huallaga* ab. "*jurimaguensis*" Staudinger, 1885 [1884-1888]: 62 (Jurimaguas, Peru).] Haensch, 1909: 125. Bryk, 1937: 493. d'Almeida, 1951: 3, 7, 9, 17; pl. 5, fig. 3.

The collections made by Henry W. Bates in the Amazon valley during the years 1848 to 1859 was sold through the auctioneer, J. C. Stevens of London; most of the butterflies were bought by Godman and Salvin. During the winter of 1964-1965 I noticed a female in the Godman and Salvin collection bearing a label, "Sao Paulo, Upper Amazon, H. W. Bates, M. olivencia". This specimen agrees in detail with Bates' description and is the previously overlooked holotype of *olivencia*; it has been recorded as number 18170 in British Museum (Natural History). Because this holotype was lost for so many years, the species has been previously misidentified.

The holotype and three paratypes (one of which is *aeneola*) of *huallaga* were taken by Hahnel at Jurimaguas, Peru; they were lent to me for study by Zoologische Sammlung der Humboldt-Universitat, Berlin. The three males constituting the type series of "jurimaguas" also were captured at Jurimaguas by Hahnel and are in the same collection. Since it was proposed for an aberration, this name is not available (International Code, Article 45).

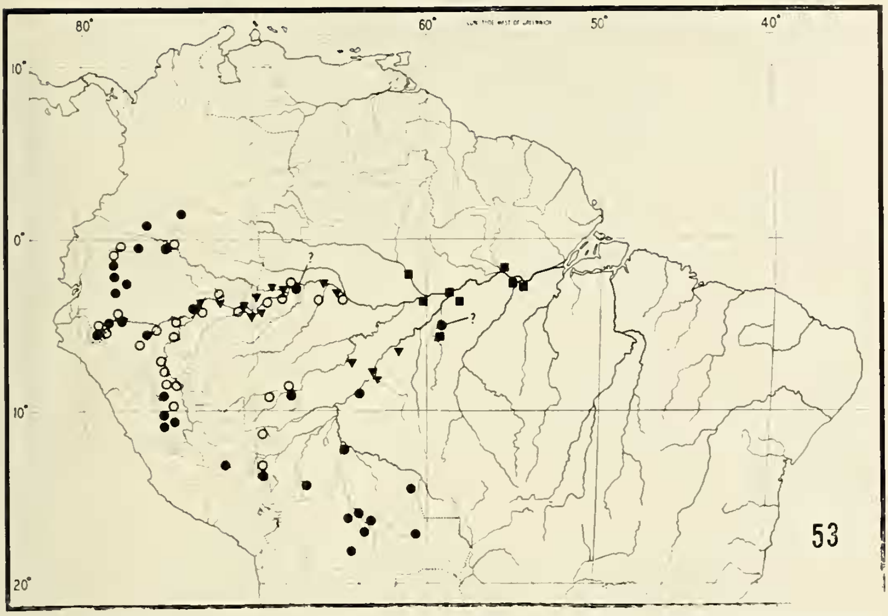


Fig. 53, South America: open circles, distribution of *F. olivencia* Bates; solid circles, *F. t. juntana* (Haensch); solid triangles, *F. t. truncata* (Butler); solid squares, *F. t. oiticicai* (d'Almeida).

Figs. 54-55, *F. olivencia* (Bates). Fig. 54, holotype ♂ of *Mechanitis huallaga* Staudinger, Jurimaguas, Peru, ZMH. Fig. 55, holotype ♂ of *Mechanitis huallaga* ab. "jurimaguas" Staudinger, Jurimaguas, Peru, ZMH. Natural size.

Forbes (1948: 13) attributed a "deep red ground color" to *olivencia* in contrast to a "bright tawny ground color" for *huallaga*, but Bates (1862: 532) specifically stated that the ground color of *olivencia* was like that of *Mechanitis mazaeus* as illustrated by Hewitson (1860 [1852-1876], 2: pl. [14], fig. 8) and such is indeed the case.

Throughout its range *olivencia* is variable. The forewing postmedian fascia may be entirely of a tawny hue only slightly lighter than the base of the wing (*huallaga*), pale tawny with yellow scaling near the costa (*olivencia*) or entirely yellow ("jurimaguensis"). The hindwing markings also vary; in describing "jurimaguensis", Staudinger stressed their width and heaviness, but they may also be thin and narrow, though rarely as evenly linear as in *aeneola* and some *juntana*. The characteristics used in the key appear to be the most consistently useful.

Specimens examined, 98 ♂, 30 ♀:

COLOMBIA: **Amazonas:** Caucayá, 2 ♂ (AMNH, CM).

ECUADOR: **Oriente:** Aguano, Rio Napo, 3 ♂ 4 ♀ (BM).

PERU: **Amazonas:** Rio Cenipa, Rio Nievo, Rio Santiago: 5 ♂ 2 ♀ (AMNH, CM). **Loreto:** Achinamiza, Rio Aguaytia, Rio Amapa (middle Rio Ucayali), Balzapuerto, Caballococha, Rio Cachiyacu (near Iquitos), Chambireyacu (near Yurimaguas), Rio Cushabatay, Iquitos, Rio Marañon, Rio Pacaya, Pebas, Pucallpa, Rio Ucayali, Lago Yarina-Cocha, Yurimaguas, 61 ♂ 18 ♀ (AMNH, BM, CM, RM, ZMH, ZSB). **Huánuco:** Pozuzo, Tingo Maria, 4 ♂ (BM, CAS). **Junín:** Rio Palcazú, 1 ♀ (BM). **Puno:** La Unión (Rio Huacamayo), 1 ♂ (BM). **Madre de Dios:** Iberia, 1 ♀ (AMNH).

BRAZIL: **Amazonas:** Bocca do Acre, Rio Jurúa, São João (Rio Solimões), São Paulo de Olivençia, Rio Solimões, Teffé, Tonatins, 10 ♂ 2 ♀ (AMNH, BM). **Acre:** Senna Maduriera, 1 ♂ (BM). **Vague:** Brazil, Amazons, 7 ♂ 1 ♀ (BM, CM, MCZ).

ERRORS: Corumba, 1 ♀ (MCZ); Santa Catarina, 1 ♂ (BM).

NO DATA: 2 ♂ (CM, MCZ).

Forbestra truncata

This species looks much like *F. olivencia*, but may be distinguished by the marginal band on the underside of the forewing apex (fig. 56): in *truncata* the dark marginal band (black, brown or coppery) is wide enough that the white submarginal dots lie within it, while in *olivencia* the marginal band is very narrow and the white dots lie proximad of it in the tawny ground color.

There are three subspecies (fig. 53). *F. t. juntana* is found in the

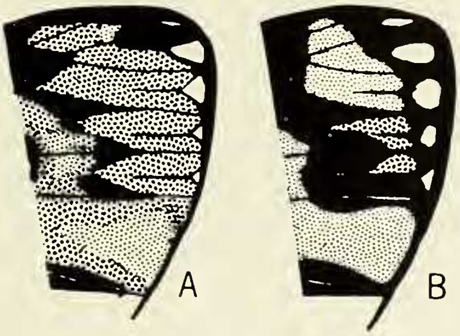


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Fig. 56. undersides of forewing apices of *F. olivencia* Bates (fig. 56A) and of *F. t. juntana* (Haensch) (fig. 56B) showing distinctive details of pattern.

tropical valleys of the Andes from southern Colombia to Bolivia; *t. truncata*, characterized by the striking mahogany ground color, occurs from the lower Rio Putumayo to the Rio Madeira in a region with Teffé as the center; in Pará and the lower Amazon valley is found *t. oiticiai*, which more resembles *juntana* than neighboring *truncata* in coloring, but has the yellow fascia of the forewing distinctly wider and the discocellular spots smaller and well separated.

Forbestra truncata juntana (Haensch) (Figs. 39, 53, 57)

Mechanitis olivencia juntana Haensch, 1903: 167; pl. 3, fig. 2 (Coca, Ecuador). 1909: 125; pl. 34a. Forbes, 1924: 146, 149, 154; pl. 12, fig. 7. Bryk, 1937: 495. Fox, 1940: 182.

The type of *juntana* is in Zoologische Sammlung der Humboldt-Universitat, Berlin. A male in the Munich collection taken by Haensch at Coca, Ecuador, is certainly a paratype.

Specimens examined, 168 ♂ 98 ♀:

COLOMBIA: **Caquetá:** Rio Orteguaza, 5 ♂ (AMNH, CM). **Putumayo:** Mocoa, 1 ♂ (ZSB). **Amazonas:** Caucayá, 24 ♂ 3 ♀ (AMNH, CM).

ECUADOR: **Oriente:** Aguano, Archidona, Canelos, Chapiensa, Coca, Pacayacu, Zulay, 11 ♂ 3 ♀ (AMNH, BM, CM, ZSB) . **Vague:** Ecuador, 7 ♂ (BM, MCZ).

PERU: **Amazonas:** Rio Cenipa, Quebrada Huachinza, Rio Nievo, Pongo de Manseriche, Puerto Melendez, Rio Santiago, 11 ♂ 9 ♀ (AMNH, CM). **Loreto:** Iquitos, Rio Paranapura, 1 ♂ 1 ♀ (AMNH, BM). **Huánuco:** Pozuzo, Rio Santa Cruz, Tingo María, 5 ♂ 7 ♀ (AMNH, BM, CAS, CM, ZSB).

Junin: Rio Colorado, La Merced, Rio Perené, San Ramón, Satipo, 13 ♂ 21 ♀ (AMNH, BM, CM). **Puno:** La Unión (Rio Huacamayo), 1 ♂ (BM). **Cusco:** Rio Chanchosmayo, 6 ♂ 11 ♀ (BM). **Vague:** Peru, northeastern Peru, 1 ♂ 1 ♀ (AMNH).

BRAZIL: **Amazonas:** Bocca do Acre, Jutahy (Rio Madeira) (error ?), Tonatins (error ?), Upper Amazons, 2 ♂ 3 ♀ (BM, CM). **Guaporé:** Santo Antonio (Rio Madeira), 1 ♀ (BM).

BOLIVIA: **Beni:** Rio Mamoré, Reyes, Santa Rosa, 4 ♂ 3 ♀ (BM, CM, ZSB). **Cochabamba:** Rio Chapare, Todos Santos, 26 ♂ 10 ♀ (CM, JHM, ZSB). **Santa Cruz:** Amazonica-Trinidad region, Buenavista, Cuatro Ojos, Las Juntas, San Mateo, Sará, Rio Surutu, Rio Yapacani, 48 ♂ 23 ♀ (BM, CM, ZSB).

ERRORS: "Jal. Mex.", 1 ♂ (MCZ); Pará, 1 ♂ (BM).

Forbestra truncata truncata (Butler) (Figs. 46, 53, 58)

[*Mechanitis egaensis* var. 2, Bates, 1862: 523].

Mechanitis truncata Butler, 1877b: 150 (Ega). Haensch, 1905: 125. Forbes, 1924: 146, 147, 149, 153-154; pl. 12, fig. 4. Riley & Gabriel, 1925: 49. Kremky, 1925: 204, 205; text figs. 65, 67, 68, pl. 22, fig. 5. Bryk, 1937: 495. Fox, 1940: 182. d'Almeida, 1960: 2.

=*Mechanitis olivencia*, Forbes (not Bates), 1948: 12-13.

The male in British Museum (Natural History) from "Ega, Amazons, Bates 56-111" is hereby designated as lectotype of *truncata* and is numbered 18266. The male cited by Riley and Gabriel (1925) as type (number 7061 in British Museum) was collected by Trail on the Rio Madeira and cannot be the true type because Butler merely referred to Bates' "var. 2", without giving a description; Bates' "var. 2" material is, therefore, the type series.

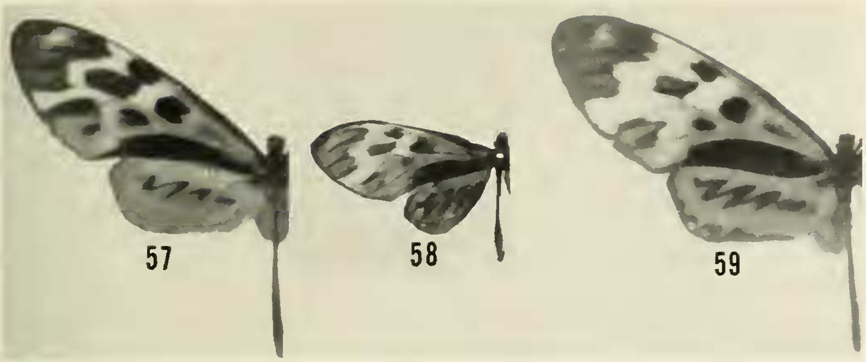
Apparently accepting Forbes' (1948) misidentification, d'Almeida (1960) stated that the type of *truncata* is a male of *olivencia*. The differences between them have already been pointed out.

Specimens examined, 197 ♂, 43 ♀:

COLOMBIA: **Amazonas:** Rio Cotuhé, lower Rio Putumayo, 1 ♂ 1 ♀ (AMNH).

PERU: **Loreto:** Caballococha, Rio Cachiyacu (near Iquitos), Iquitos, Rio Marañon, Pebas, 7 ♂ 14 ♀ (BM).

BRAZIL: **Amazonas:** Calama, Canutama, Fonte Bôa, Humaytá, lower Rio Madeira, Santa Maria dos Marmelos, São João (some as "San Juan"), São Paulo de Olivençia, Rio Solimões, Tabatinga, Teffé, 176 ♂ 26 ♀ (BM, CM, MCZ, ZSB). **Vague:** Amazonas, upper Amazon, Brazil, 6 ♂ 1 ♀ (BM, CM, MCZ).



Figs. 57-59. Fig. 57, *F. t. juntana* (Haensch), ♂, Rio Yapacani, Santa Cruz, Bolivia, CM. Fig. 58, *F. t. truncata* (Butler), holotype ♂, Ilha des Araras, Rio Madeira, Brazil, BM. Fig. 59, *F. t. oiticicai* (d'Almeida), ♂, Villa Franca, Pará, Brazil, CM. About natural size.

ERRORS: Itiatuba, Obidos, 7 ♂ (BM).
NO DATA: 1 ♀ (CM).

Forbestra truncata oiticicai (d'Almeida) (Figs. 53, 59)

Mechanitis oiticicai d'Almeida, 1951: 12-13, 17; pl. 3, figs. 1, 2 (Obidos).

The male holotype and female allotype, numbers 14,029 and 14,030 respectively in Museu Nacional do Rio de Janeiro, are both from Obidos, Pará. This population of *truncata* from the lower Amazon valley is easily recognized by the orange tawny ground color, slightly darker than that of *truncata* but much lighter than that of *juntana,* and the smaller size of the forewing discocellular spots and much greater breadth of both the yellow postmedian fascia on the forewing and the black marginal band of the hindwing. The seven males of *juntana* from "Obidos" and "Itiatuba" in British Museum, noted above, are almost certainly incorrectly labelled.

Specimens examined, 32 ♂, 39 ♀:

BRAZIL: Amazonas: Juhuty (Rio Madeira), Manáos, Maués, Rio Negro, [Isla] Serpa, 7 ♂ 13 ♀ (BM, ZSB). Pará: Obidos, Santarém, Villa Franca, 25 ♂ 26 ♀ (BM, CM). Vague: Brazil, 1 ♀ (BM).

Genus **MECHANITIS** Fabricius

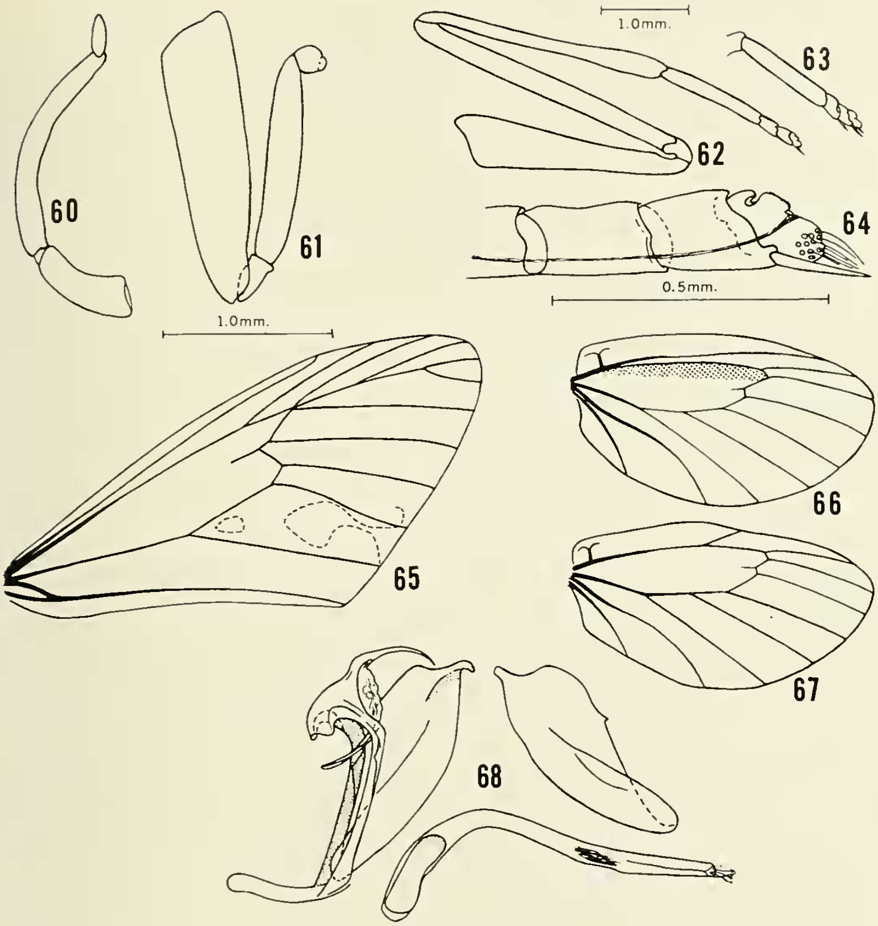
Mechanitis Fabricius, 1807: 284. Type-species: *M. polymnia* (Linné), designated by Scudder, 1875. Hübner, 1816 [1816-1827]: 11. Doubleday, 1844: 55. 1857 [1846-1852]: 128-130. Bates, 1862: 497, 501, 503, 511, 528-532. Kirby, 1871: 23. Scudder, 1875: 212. Burmeister, 1879a: 112, 120-121. Godman & Salvin, 1879 [1879-1901]: 18. Staudinger, 1885 [1884-1888]: 61. Schatz, 1886 [1885-1892]: 87, 91-92. Haase, 1893: 53. Reuter, 1896: 40, 325, 327, 552. Holland, 1898: 86. Thieme, 1899: (13), (14), (15). Stichel, 1901: (17). Kirby, 1908 [1894-1912]: 2. Kaye, 1907: 415. de Silva, 1907: 36. Haensch, 1909: 124. d'Almeida, 1923: 233. Forbes, 1924: 145-157. Kremky, 1925: 144, 148, 149, 153, 158, 159, 176, 178, 180, 203-209; text figs. 64-75; pl. 22, figs. 4-7. Forbes, 1927: 23-25, 28, 29, 31, 32. Köhler, 1929: 307, 315. Röber, 1930: 20. Hemming, 1933: 199. 1934: 27. 1937, 2: 222. Forbes, 1937: 86. Bryk, 1937: 483-497. Fox, 1940: 165, 166, 167, 172, 174, 181-182; pl. 7, figs. 35, 36. Forbes, 1941: 1-4. d'Almeida, 1942: 183, 185, 187, 189. Forbes, 1948: 10-23; pl. 2. d'Almeida, 1951: 1-17.

=*Nereis* Hübner, 1806 [1806-1838], 1: figs. 1, 2, 5, 8, 12, 15. Type-species, *Nereis polymnia* (Linné), designated by Scudder, 1875; preoccupied by *Nereis* Linné, 1758. Scudder, 1875: 227. Hemming, 1934: 27. 1937, 1: 595, 2: 14. Bryk, 1937: 484. Fox, 1940: 181. d'Almeida, 1942: 189-192.

[=*Hymenitis* Anonymous (Illiger ?), 1807 (not *Hymenitis* Hübner, 1816): column 1180. Type-species, *Papilio polymnia* Linné, designated by Hemming, 1934.] Hemming, 1934: 27-28. Bryk, 1937: 483. Fox, 1940: 181. d'Almeida, 1942: 187. Fox, 1963: 173-175.

I have discussed elsewhere (Fox, 1963) my reasons for regarding *Hymenitis* Anonymous as having been improperly proposed and hence not available for purposes of nomenclature. The important point is that *Hymenitis* Hübner should not become a homonym because of Illiger's long-forgotten feud with Hübner, during which the former unethically and in a distorted manner printed some of the contents of a manuscript by the latter.

The first systematic attempt to define *Mechanitis* was by Doubleday (1847 [1846-1852]), who included species now assigned to *Melinaea* or *Scada*. Godman and Salvin (1879 [1879-1891]) and Schatz (1886 [1885-1892]) characterized the genus in terms followed by all subsequent students until the present study in which *equicola* and allies are removed to *Forbestra*.



Figs. 60-68, morphological characteristics of the genus *Mechanitis*. Fig. 60, palpus; fig. 61, male foreleg; fig. 62, female foreleg, all of *M. i. isthmia* Bates; fig. 63, female foretarsus of *M. lanei* new species, drawn to scales shown. Fig. 64, female foretarsus of *M. i. isthmia* Bates, enlarged. Fig. 65, forewing with comma mark and cubital spot outlined; fig. 66, male hindwing; fig. 67, female hindwing, all of *M. p. polymnia* (Linné), about twice natural size. Fig. 68, male genitalia of *M. p. doryssus* Bates from David, Panama; slide 803, CM; penis and dissected left valve shown separately; drawn to scale shown under fig. 61.

Mechanitis is defined as follows:

Palpus (fig. 60). — first segment curved, appressed to the head; second segment twice as long as first, lightly curved; third segment small and ovoid, about one-eighth the length of the second.

Antennae. — two-thirds the length of the body, one-half the length of a forewing.

Male foreleg (fig. 61). — coxa small, stout, articulate, longer than trochanter plus femur plus tibio-tarsus; femur a little more than one-half the length of coxa; tibia and tarsus little larger than trochanter, fused as a knob on the tip of femur with tarsus only a minute projection on the spheroid tibia.

Female foreleg (figs. 62-64). — tarsus apparently composed of only four subsegments, all less thickened than in *Forbestra.* A pair of spurs on the second subsegment, none on the first; third subsegment usually lacking spurs, but the inner spur sometimes is present and in a few individuals, both are present. First segment more than twice the length of the other three combined, slender; second segment cylindrical; third somewhat compressed; fourth knob-like and bearing a patch of trichoid sensillae on the inner ventral surface.

Venation (figs. 65-67). — forewing with R_1 branching close to the apex of the cell and R_2 branching beyond it; 1d short or, if absent, M_1 stalked from R_s at the cell apex or at a distance beyond it never greater than the length of 2d; 2d short and straight; 3d angled, with a strong R_c from the apex of the angle. Hindwing of males with 1d short, straight, at least one-third the length of 2d; Sc and R run side by side well beyond the humeral, then gradually separate, Sc reaching the margin at the wing apex. In females, 1d frequently present, but if absent, M_1 branches at cell apex or beyond it at a distance always less than the length of 2d; Sc and R completely coalesced for two-thirds of the distance to the end of the cell (about as far as the branching of Cu_1), then Sc veers steeply to the costal margin, reaching it proximal of the end of the cell. Humeral vein in both sexes strongly forked. Hair pencil of males complete from base to apex of cell.

Wing pattern. — comma mark of forewing (figs. 65, 69) formed from a streak *in* Cu_1-Cu_2 (never directly *over* Cu_1) joined to a round postmedial spot in the same cell; discal cell with basal streak always absent.

Male genitalia (fig. 68). — tegumen and uncus not separated by a suture, tegumen hood-like, uncus long, slender and down-curved at its tip; vinculum slender, continuous with tegumen; saccus a little more than half the length of tegumen plus uncus. Gnathos and associated membrane lightly sclerotized, ribbon-like, articulating at each end with base of uncus. Juxta narrow, V-shaped. Valve roughly triangular, the sacculus deeply folded and evenly curved; costal margin with a prominent swelling near the apex, giving the apex a two-humped appearance; apex proper armed with a short, down-curved tooth. Penis about twice the length of tegumen plus uncus, strongly down-curved at the foramen; foramen one-fifth to one-sixth the length of penis.

Mechanitis comprises a series of polytypic, closely related parallel species. Each subspecies typically is quite variable. No reliable species characters were found in male genitalia, legs, palpi or any other structure. Only the pattern and coloring of the wings is available as a basis for sorting the species and subspecies; although pattern and color have been the traditional characters in butterflies, they are usually unsatisfactory as a sole taxonomic base and often have led to incorrect conclusions. Only the general commonness of most *Mechanitis* and the availability to me of long series of both sexes has enabled an analysis. Had I had only short series and limited material at my disposal, I would have been seriously misled.

In short, this genus is one of the most deceptive, confusing aggregations among all the butterflies and it is small wonder that previous revisions have been less than satisfactory.

After various false starts, I finally used a geographic approach based upon finding four distinct species in Central America. I traced these four species south and east through the South American tropics and attempted in each biographic area to recognize, despite their varied guises, the local subspecies of each of the four basic species. During this process, five more species not represented in Central America were found. The result was 36 subspecies belonging to nine species.

The next problem was to find the names of each entity. All descriptions in the literature and most of the holotypes were compared with material at hand. It must be noted that many of the names recorded under *Mechanitis* were not names of biological entities but the names of spots and colors. As a result, a certain number of names, including some familiar ones, have had to be placed into synonymy, not because the kind of insect named is not recognizable but because it is a normal part of a variable population having a prior name. Further, a certain number of names that have been in use were first published as aberrations or as quadrinomials and cannot properly be used for species or subspecies unless subsequently validated by an author applying them at the species-group level. Finally, some names, though properly proposed, were doomed to extinction from the outset because they were absolute synonyms and quite unnecessary. A case at point was the unfortunate paper on the Amazonian and Peruvian fauna by Bryk (1953), in which thirtyone new names were proposed for ithomines, but only one or two (accidently, I think) were not some well-known, easily identifiable insect already named.

Just as the name of a species encompasses all the subspecies, so the name of a subspecies encompasses all its variations. In some instances, a subspecies of a *Mechanitis* species is best defined in terms of variation, recognizably different from the variation found in adjacent subspecies. To the philatelistic lepidopterist, who wants all the specimens arranged above an identification label in his cabinet to look alike, this is a horrid and intolerable situation. To the biologist, the situation is both fascinating and instructive.

Certainly, the taxonomic problem of *Mechanitis* is in contrast with the kind of problem presented by such genera as *Olyras,* in which the species are clear-cut morphologically and the individuals of a population vary only within narrow limits. In *Mechanitis* the species are plastic. One has the impression that even now they are undergoing a relatively rapid rate of evolution. Possibly *Mechanitis* has expanded geographically during geologically recent time into the near-sea-level areas of Central and South America, areas which previously had been ecologically unavailable to them and to the plants with which they are associated. Yet the historical geography of the Pleistocene in tropical America cannot be the whole story. The insects we call *Mechanitis* apparently developed genetic traits that enabled them to evolve more rapidly and to take advantage of the rearrangement of ecological areas and ecological niches in the tropics attendant upon the cyclic glaciation of the northern hemisphere. Of all the ithomine groups thus far presented in this monograph, *Mechanitis* most gives the impression of evolutional exuberance and ecologic adaptability. It is possible that in X-number of centuries from now, the species of *Mechanitis* will be easy to sort: at present they are very difficult and one can only infer the inherent gene differences which are, in the end, the real criteria of species.

Key to Species and Subspecies of Mechanitis

1. Postmedian fascia of forewing represented only by small light spots, usually one in M_3-Cu_1 and one in R-M_1, but others may also be present or these may be absent. .... (*M. lysimnia*) 2

Postmedian fascia of forewing complete from Cu_1 to the costa or interrupted only by black at M_3. 6

2. Forewing with large yellow spots in end of discal cell and middle of Cu_1-Cu_2, broadly separated by the enlarged black cubital spot. .... *M. l. elisa* Guérin-Méneville

Forewing with yellow in end of cell and in Cu_1-Cu_2 almost always connected and forming a continuous band: cubital spot often absent. 3

3. Disc of hindwing tawny. 4

Disc of hindwing yellow, at least on underside. 5

4. Hindwing postmedian band wide and heavy in males (and a very few females), vestigial and reduced to its apical elements in most females .... *M. l. macrinus* Hewitson

Hindwing postmedian band thin and zigzag in both sexes .... *M. l. connectens* Talbot

5. Comma mark (fig. 691) and anal bar of forewing not meeting, the tawny spot in anal angle widely connected with ground color proximad; apical spot usually yellow .... *M. l. nesaea* Hübner

Comma mark and anal bar of forewing connected. isolating a tawny spot in the anal angle: apical spot usually white .... *M. l. lysimnia* Fabricius

6. Hindwing mostly black, with tawny only along the margin at the apex and on the humeral angle on the underside: in unusual individuals having some tawny between postmedian and marginal bands, the discal cell is mostly black .... (*M. messenoides*) 7

Hindwing with separate postmedian and marginal bands, or the postmedian band absent: if the bands are fused into a patch, the discal cell is mostly tawny 8

7. Forewing postmedian fascia bright golden yellow .... *M. m. messenoides* Felder

Forewing postmedian fascia dull tawny-yellow .... *M. m. ballucatus* new subspecies

Forewing postmedian fascia tawny .... *M. m. deceptus* Butler

8. Lower discocellular spot formed like a recumbent heart, its outer edge scalloped in at M_3, and the black of the comma mark extended to it along Cu_1, postmedian fascia translucent 9

Lower discocellular spot round, rectangular or its shape obscured; if it is heart-shaped, with its outer edge scalloped in at M_3, the black of the comma mark is not extended to it along Cu_1 10

9. Outer edge of postmedian fascia of forewing with a finger-like extension in M_1-M_2 which reaches nearer the margin than the element in M_2-M_3 .... *M. lanei* new species

Outer edge of postmedian fascia of forewing with the element in M_1-M_2 reaching no nearer to the margin than the element in M_2-M_3 .... *M. limnaea* Forbes

10. A continuous band on the forewing formed by the fusion of the comma mark and the discocellular spots 11

Comma mark and discocellular spots of forewing not broadly fused to form a band, at most being narrowly connected by black over Cu$_1$ .. 15

11. An isolated tawny spot in anal angle of forewing, of this area black 12

Tawny in anal angle of forewing not isolated from ground color proximad 13

12. Hindwing median band placed well away from marginal band, or absent .... *M. i. isthmia* Bates

Hindwing median band separated from marginal band by a narrow tawny band narrower than either: discs of both wings with bright yellow bands .... *M. m. mantineus* Hewitson

13. Median band of hindwing greatly widened toward apex and often fused with marginal band; white submarginal spots strong on upperside of hindwing .... *M. m. menapis* Hewitson

Median band of hindwing of even width, not widened toward apex; white submarginal spots faint or absent on upperside of hindwing 14

14. Postmedian fascia of forewing very narrow, the element in M$_3$-Cu$_1$ not as wide as the stem of the comma mark .... *M. m. saturata* Godman

Postmedian fascia of forewing moderate, the element in M$_3$-Cu$_1$ wider than the stem of the comma mark ...... *M. m. caribensis* new subspecies

15. Head of comma mark rounded, its proximal edge dropping nearly perpendicularly from Cu$_1$ (fig. 69A), or distal half of Cu$_1$-Cu$_2$ filled with black 16

Head of comma mark expanded, its proximal edge slanting obliquely away from Cu$_1$ (figs. 65, 69D, E, F) and distal half of Cu$_1$-Cu$_2$ never filled with black 23

16. Discocellular spots separated, of equal size or the upper larger 17

Discocellular spots fused 18

17. Black markings of hindwing as well developed on underside as above .... *M. i. caucaensis* Haensch

Black markings on underside of hindwing reduced, not as well developed as on upperside .... *M. i. chimborazona* Bates

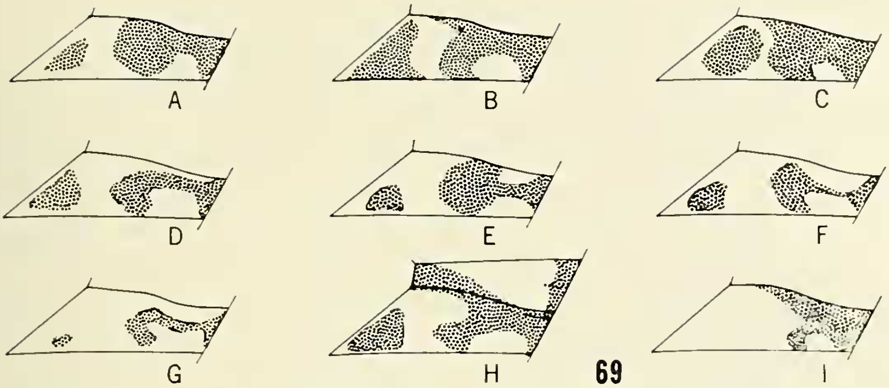
18. Discal area of hindwing yellow in males and some females 19

Discal area of hindwing tawny in both sexes 20

19. Lower discocellular spot apparently larger than the upper and generally touching the comma mark .... *M. i. eurydice* Haensch

Lower discocellular spot no larger than the upper and never touching the comma mark .... *M. i. bolivarensis* new subspecies

20. Postmedian fascia of forewing angulate, a finger-like extension of its outer edge in M$_1$-M$_2$ which reaches nearer the margin than the oblong element in M$_2$-M$_3$; apical spot with orange scaling on the underside and often also above; middle of Cu$_1$-Cu$_2$ usually yellow .... *M. i. doryssides* Staudinger



69

Fig. 69, details of forewings of nine *Mechanitis* species showing arrangement of comma mark and cubital spot in cell Cu$_1$-Cu$_2$. A, *M. i. veritabilis* Butler, Venezuela. B, *M. lanei* new species, Pará, Brazil. C, *M. limnaea* Forbes, French Guiana. D, *M. p. doryssus* Bates, Venezuela. E, *M. m. pannifera* Butler, British Guiana. F, *M. e. phasianita* Haensch, Rio Jurúa, Brazil. G, *M. m. messenoides* C. & R. Felder, southern Colombia. H, *M. m. caribensis* new subspecies, northern Colombia. I, *M. l. nessaea* Hübner, Pernambuco, Brazil. Compare also figs. 38, 39 and 65.

Postmedian fascia of forewing undulate, the element in M$_1$-M$_2$ reaching no nearer the margin than the element in M$_2$-M$_3$, or only very little; apical spot yellow, almost never with any orange scaling beneath 21

21. Hindmarginal bar of forewing wide and heavy, the anal bar reaching the comma mark and isolating a tawny spot in the anal angle; middle of Cu$_1$-Cu$_2$ bright yellow .... *M. i. caucaensis* Haensch

Hindmarginal bar of forewing slender, the anal bar not reaching the comma mark and often absent; middle of Cu$_1$-Cu$_2$ tawny or weakly yellow 22

22. Fused discocellular spots touching the tip of the comma mark, or nearly; apical spot generally about as wide as the postmedian fascia .... *M. i. veritabilis* Butler

Fused discocellular spots usually well separated from comma mark, but sometimes touching it; apical spot very slender, much narrower than postmedian fascia .... *M. i. kayei* new subspecies

23. Discocellular spots of forewing of equal size, or the upper a little larger, even when they are fused .... (*M. polymnia*) 24

Lower discocellular spot larger than the upper 28

24. Postmedian fascia of forewing as wide as or wider than the black apex; discocellular spots fused or separate .... *M. p. solaria* Forbes

Postmedian fascia of forewing not as wide as the black apex 25

25. Apical spot of forewing well developed, yellow-ochre with tawny scaling at its edges; hindmarginal and anal bars generally well developed, but some females with these bars and the hindwing median band reduced or absent .... *M. p. doryssus* Bates

Apical spot of forewing usually absent, but sometimes a small patch of yellow scaling present; hindmarginal bar usually tapering to a point before reaching anal angle and the anal bar missing or weak 26

26. Disc of hindwing yellow and the median band light and zigzag .... *M. p. casabranca* Haensch

Disc of hindwing rarely yellow and if so, the median band heavy 27

27. Tawny coloring between hindwing median and marginal bands always wider than either; middle of Cu_1-Cu_2 yellow; tawny ground color somewhat lighter and yellower than in *polymnia* .... *M. p. angustifascia* Talbot

Tawny coloring between hindwing median and marginal bands generally narrower than either; middle of Cu_1-Cu_2 tawny or with only slight yellow scaling; tawny ground color reddish .... *M. p. polymnia* (Linné)

28. Anal bar of forewing strong and well marked; apical patch diffuse and usually occupying most of the apex, giving the appearance of a light spot ringed with narrow black .... (*M. egaensis*) 29

Anal bar of forewing absent or faint; apical patch small or absent .... (*M. mazaeus*) 31

29. Postmedian fascia and apical patch of forewing tawny .... *M. e. phasianita* Haensch

Postmedian fascia entirely and the apical patch at least partly yellow .. 30

30. Ground color deep mahogany; end of forewing discal cell and middle of Cu_1-Cu_2 with, at most, slight yellow scaling .... *M. e. egaensis* Bates

Ground color tawny mahogany; end of forewing discal cell and middle of Cu_1-Cu_2 with strong yellow scaling .... *M. e. contracta* Riley

31. Forewing postmedian fascia tawny .... some *M. m. mazaeus* Hewitson

Forewing postmedian fascia yellow 32

32. Hindwing marginal band rounding apex and continuing to costa as a black line about 1 mm. wide; forewing black spots always small, even when discocellular spots are fused; hindwing bands fused into a patch or only narrowly separated .... *M. m. pannifera* Butler

Hindwing marginal band stops short of apex or continues only as a very thin line 33

33. Hindwing median band wide, but near the anal margin reduced to a couple of small separate spots .... *M. m. beebei* Forbes

Hindwing median band not reduced near the anal angle, of normal width throughout and sometimes fused with marginal band 34

34. Forewing postmedian fascia undulate, the element in M_1-M_2 reaching no nearer the margin than the element in M_2-M_3; black markings on both wings reduced, those on the hindwing to spots separated by tawny over the veins .... *M. m. pothetoides* d'Almeida

Forewing postmedian fascia angulate, the element in M_1-M_2 reaching nearer the margin than the element in M_2-M_3; black markings on forewing heavy or light but those on the hindwing generally heavy and not reduced to separated spots 38

35. Ground color mahogany-cinnamon .... some *M. m. elevata* Riley

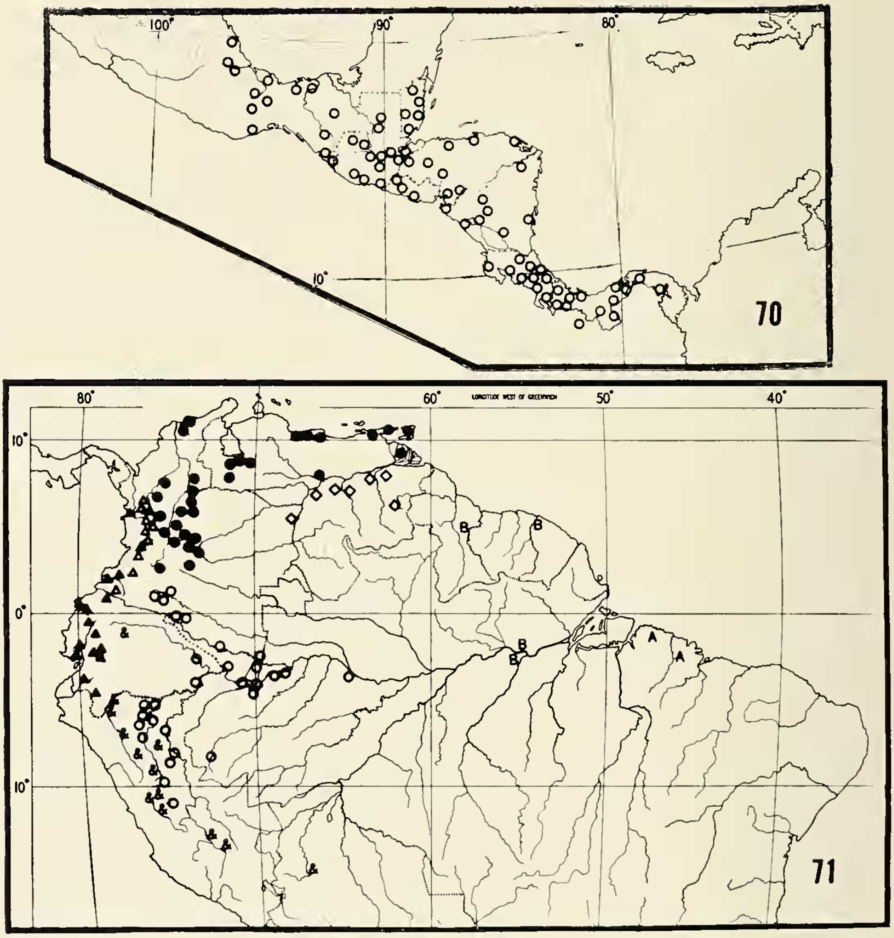
Ground color various but not mahogany-cinnamon (see discussion) .... *M. m. mazaeus* Hewitson and *M. m. elevata* Riley

Mechanitis isthmia

It is perhaps regrettable that the senior name for this complex of eight subspecies is *isthmia* Bates, originally proposed for a population on the Isthmus of Panama, since the species as a whole is distributed (figs. 70, 71) from the northern limits of the humid tropics in Mexico, south to Peru and east to Trinidad — but the suitability of a name has nothing to do with its use.

The size of the lower discocellular spot of the forewing relative to the upper varies with the subspecies. The proximal end of the comma mark, when it is not obscured in a darkened area, tends to be more or less rounded or even circular. Various of the subspecies have generally been attributed to *polymnia* in the past, but throughout Central America, Venezuela, Trinidad, northern Colombia and the Rio Solimões of Brazil there are always found two distinct but closely similar populations: clearly there must be two species. It is not possible to point to one or two clear-cut differences which would separate these two, because in every population there are a certain number of individuals that either have the significant character obscured or have it formed in some aberrant fashion. In main, the connection between the comma mark and the margin in *isthmia* is placed against Cu_1, so that the postmedian fascia is always sharply limited by that vein, while in *polymnia,* when this connection is reduced and thinned, it runs out in the middle of the cell, so that the postmedian fascia crosses Cu_1. A second distinction is that all *polymnia* subspecies are lighter than the *isthmia* subspecies in the same area, which generally have heavier black markings, especially on the forewings, so that the fused discocellular spots are often also fused with the comma mark and may form a black cross-band, and the anal bar frequently connects the hindmarginal bar with the comma mark so that a tawny spot is cut off in the anal angle.

The eight subspecies of *isthmia* are distributed as follows (figs. 70, 71): *i. isthmia* is Central American and evidently is not found



Figs. 70-71, distribution of three *Mechanitis* species. Fig. 70, Central America: open circles, *M. i. isthmia* Bates. Fig. 71, South America: solid circles, *M. i. veritabilis* Butler; open diamonds, *M. i. bolivarensis* new subspecies; solid diamonds, *M. i. kayei*, new subspecies; open triangles, *M. i. caucaensis* Haensch; solid triangles, *M. i. chimborazona* Bates; open circles, *M. i. doryssides* Staudinger; ampersands, *M. i. eurydice* Haensch. A, *M. lanei* new species. B, *M. limnaea* Forbes.

south of Darien; *i. veritabilis* occupies northern Colombia and northern Venezuela; *i. bolivarensis* comes from the Bolívar and Amazonas, Venezuela; *i. kayei* is the Trinidad subspecies; *i. caucaensis* is limited to a small region between Medellin and Cali in the valley of the Rio

Cauca, Colombia; *i. chimborazona* is found on the western slopes of Ecuador and Colombia; *i. doryssides* comes from southeastern Colombia, northeastern Peru and the adjacent part of Brazil; *i. eurydice* is found in eastern Ecuador, northern and central Peru, apparently at elevations somewhat higher than those occupied by *doryssides*.

It is of interest to note that the darkest forms are centered from Costa Rica south to western Ecuador, while the lighter forms occur to the north, to the east and to the south. The Central American population gives the impression that genetic melanism has invaded the area from the south; in Central America dark and light forms occur almost everywhere, but the ratio of light forms increases northward. On the continent, dark forms and light forms are geographically distinct.

Mechanitis isthmia isthmia Bates (Figs. 60-62, 64, 70, 72)

Mechanitis isthmia Bates, 1863: 247; pl. 29, fig. 1 (Lion Hill, Panama). Kirby, 1871: 23. Butler & Druce, 1874: 334. Godman & Salvin, 1879 [1879-1901], 1: 19, 20; pl. 1, figs. 11, 12. Staudinger, 1885 [1884-1888]: 61. Haase, 1893: 53. Godman, 1901 [Godman & Salvin, 1879-1901], 2: 642. Haensch, 1909: 126; pl. 34b. Dyar, 1914: 145. Köhler, 1923: 20. Forbes, 1924: 146, 151, 155. Riley & Gabriel, 1925: 27. Köhler, 1929: 307, 317. Huntington, 1932: 196. Bryk, 1937: 488. Fox, 1940: 182. Forbes, 1948: 13.

=*Mechanitis lycidice* Bates, 1864: 33 (Choacus, Guatemala). Kirby, 1871: 24. Butler & Druce, 1874: 334. Godman & Salvin, 1879 [1879-1901], 1: 19; pl. 1, figs. 7, 8. Godman, 1901 [Godman & Salvin, 1879-1901], 2: 642. Haensch, 1905: 147. Moulton, 1909: 587. Haensch, 1909: 126; pl. 34a. Forbes, 1924: 146, 148, 151, 155. Riley & Gabriel, 1925: 31. Bryk, 1937: 489. Fox, 1940: 182. Hoffmann, 1940: 664. Forbes, 1948: 13. d'Almeida, 1951: 7, 9, 17.

=*Mechanitis californica* Reakirt, 1865: 223 (Los Angeles, California [error]). Kirby, 1871a: 24. Scudder, 1875: 247. Strecker, 1878 [1872-1900]: 107. Holland, 1898: 87; pl. 8, fig. 2. Dyar, 1902: 23. Haensch, 1909: 126. Forbes, 1924: 155. Bryk, 1937: 488. Forbes, 1948: 11, 21.

=*Mechanitis doryssa* Boisduval, 1870: 31 (Honduras) (Preoccupied, Bates, 1864). Kirby, 1877: 840. Haensch, 1909: 126. Bryk, 1937: 489. Fox, 1940: 182. Forbes, 1948: 12.

= *Mechanitis ovata* Distant, 1876: xi. Kirby, 1877: 840. Godman & Salvin, 1879 [1879-1901]: 19. Haensch, 1909: 126. Fox, 1940: 182. Forbes, 1948: 12.

=*Mechanitis lycidice arcana* Haensch, 1909: 126 (Honduras). Forbes, 1924: 146, 151. Bryk, 1937: 489. Fox, 1940: 182.

The holotype of *M. isthmia* is a female from Lion Hill, Panama, number 7085 in British Museum (Natural History), where there are also six male and three female paratypes, numbers 7086 through 7094. Two more paratypes are in AMNH. The holotype of *M. lycidice* is a male from Choacus, Guatemala, number 7095, and the allotype is from Polochic valley, Guatemala, a female number 7096, both in British Museum (Natural History). The holotype of *M. californica* is in the Chicago Museum of Natural History, via the Strecker collection; the locality label, "California", is unquestionably spurious and the specimen probably was captured in Panama. The type of *M. doryssa* Boisduval might be in British Museum (Natural History) and the type of *M. ovata* Distant ought to be in the same collection but neither has been found. The type of *M. l. arcana* Haensch is in the Berlin Museum.

Distinguishing typical *lycidice* from typical *isthmia* is easy enough. The former has well developed light areas on the forewing, with the yellow postmedian fascia and the spots at the end of the discal cell and in the base of Cu_1-Cu_2 prominent; the forewing of the latter is strongly suffused with black so that the yellow elements and often the tawny areas at the base are greatly reduced or absent. In Vera Cruz, Mexico, typical *lycidice* is the only form present; in Panama, typical *isthmia* is characteristic, but in the regions between, the populations are mixed and every possible intergradation occurs. The majority of individuals in Guatemala and Honduras are of the light type, while in Nicaragua and Costa Rica the reverse is true. With respect to specific localities, those near sea level seem to produce more of the dark type, while those at greater altitudes seem to produce more of the *lycidice* type. The existence of the aberrational names, *ovata* and *arcana* testify to the variability of the subspecies. There is insufficient evidence at present to decide whether the differences are genetic or physiologic. Because no geographic boundary can be drawn between *lycidice* and *isthmia,* and because of the more or less clinal distribution of the black suffusion of the forewing, it seems best to treat the Central American populations as a single subspecies for which *isthmia* is the senior name.

M. i. isthmia is readily distinguished from other Central American *Mechanitis* by the fact that on the forewing the comma mark is connected to the hindmarginal bar, cutting off a tawny spot in the anal angle; in very dark specimens this spot sometimes is suffused on the upperside but is present on the underside.

Specimens examined, 837 ♂, 748 ♀:

MEXICO: **Vera Cruz:** Allende, Ayotac, Catemaco, El Chapo, Las Choapasa, Chuichapa, Córdoba, Faltipan, Guerrero, Huapacal, Jalapa, Misantla, Mundo Nuevo, Presidio, San Juan Evangilista, Tezonapa, 87 ♂ 62 ♀ (AMNH, BM, CM, MCZ, ZSB). **Oaxaca:** Chiltepec, Comaltepec, 4 ♂ 2 ♀ (CM). **Tabasco:** Teapa, Tepescuintla (?), Villa Hermosa, Tabasco, 9 ♂ 5 ♀ (AMNH, BM, JHM). **Chiapas:** Comitan, Escuintla, Palenque, Tapachula, Chiapas, 14 ♂ 4 ♀ (BM, CAS, CM, ZSB). **Vague or wrong:** Esculante, Chilapa, Colima, Isthmus of Tehuantepec, Mexico, Mexico City, Sinaloa, 13 ♂ 12 ♀ (AMNH, BM, CM, RM, MCZ).

GUATEMALA: Los Amates, Barberena, Barranca Honda, Cahabón, Chiquimulilla, Chisoy [Chixoy] valley, Chuacús, Coban, Dartmouth, Dueñas, Escuintla, Gualán, Cuidad Guatemala, Guazacapan, Mirandilla, Moca, Rio Motagua, Pal-Barrois, Palin, Panamá, Pancajché, Panimá, Rio Polochic, Quiriguá, Rabinal, Los Ramones, San Isidro, San Jerónimo, San José, Volcan Santa María, Arroyo Sayazsché, Senahú, Sucuru, Tamahú, Telemán, Laguna des Tinos, Tucuri, Veragua, 139 ♂ 145 ♀ (AMNH, BM, CAS, CM, JHM, MCZ, ZSB). **Vague:** Pacific coast, Guatemala, 11 ♂ 9 ♀ (AMNH, BM, CM, MCZ, MSU).

BRITISH HONDURAS: Augustine, Belize, Cayo district, Rio Grande, Rio Hondo, Middlesex, Punta Gorda, Rio Sarstún, Rio Tomash, 31 ♂ 26 ♀ (AMNH, BM, CM, JHM).

EL SALVADOR: Los Chorros, Ilopango, Quezaltepeque, San Agustín, Volcan San Salvador, Santa Tecla, Zaragoza, Salvador, 29 ♂ 16 ♀ (BM, CAS, JHM, ZSB).

HONDURAS: La Cambre, Canarrenas (Rio Choluteca), La Ceiba, Copán, Danlí, Lancatilla (Tela), La Libertad (Comayagua), Las Limas, Rio Patuca, Puerto Castilla, San Pedro Sula, Tegucigalpa, Tela, 55 ♂ 72 ♀ (AMNH, BM, CAS, CM, MCZ, RM, ZSB). **Vague:** Honduras, 13 ♂ 17 ♀ (BM, CM, MCZ, ZSB).

NICARAGUA: Camoapa, Chontales, Corcuera, Corinto, Volcan Cosiguina, Jinotega, Managua, Matagalpa, San Marcos, Rio Wanks, 27 ♂ 17 ♀ (AMNH, BM, CAS, RM, MCZ). **Vague:** Nicaragua, 8 ♂ 7 ♀ (AMNH, BM, MCZ).

COSTA RICA: Aguagata mountains, Avañgarez, Cachí, Colombiana, Esparta, Esparanza, Rio Estrella, Golfito, Guápiles, Irazú, Juan Viñas, Porto Limón, Moravia, Pejivalle, Pozo Azul, Puntarenas, Mt. Redondo, San José, San Mateo, Rio Sixaola, Rio Toro Amarillo, Turrialba, Villa Neilly (Puntarenas), Zent, 121 ♂ 106 ♀ (AMNH, BM, CAS, CM, HR, MCZ, RM, USNM). **Vague:** Costa Rica, 29 ♂ 34 ♀ (BM, CM).

PANAMA: Albrook Field, Ancon, Bajo Boquete, Balboa, Barro Colorado, La Boca, Bugaba, Cerro Campana, Las Cascadas, Cébaco Island, Chepo, Volcan Chiriqui, Rio Coclé, Colón, Corozal, Culebra, David, Farfan, France Field, Camboa, Gatún, Ft. Kobbe, Juan Mina, Lion Hill, Maddan Dam, Matachin, Panama City, Parida Island, Pedro Miguel, Potrerillos, Pueblo Nuevo, Puerto Armuelles, Rio Sabana, Santa Rosa (Colón), Summit, Rio Trinidad, El Valle, Veraguas, 152 ♂ 130 ♀ (AMNH, BM, CAS, CM, HR, MCZ, RM, USNM, ZSB). Vague: Panama, 76 ♂ 69 ♀ (AMNH, BM, CAS, CM, RM, MCZ).

ERRORS AND DOUBTFUL: Lower California, 1 ♂ 2 ♀ (MCZ); Cabo San Lucas, Lower California, 1 ♂ 1 ♀ (RM); California, 1 ♂ (CMNH, type of *M. californica*; probably from Panama); Golfito, Colombia, 1 ♂ 2 ♀ (AMNH, probably Golfito, Costa Rica); Colombia, 4 ♂ 4 ♀ (BM, MCZ); Bogota, 2 ♂ (BM); Espirito Santo, Brazil, 1 ♂ (BM); Juntas, Colombia, 3 ♂ 2 ♀ (BM); Brazil, 2 ♂ (AMNH); Amazons, 1 ♀ (MCZ); Bolivia, 1 ♀ (RM).

NO DATA: 3 ♂ 2 ♀ (CM, CMZ).

Mechanitis isthmia veritabilis Butler (Figs. 69A, 71, 73)

Mechanitis veritabilis Butler, 1873: 155 (Bogotá). Kirby, 1877: 694. Therese von Bayern, 1901: 247. Haensch, 1909: 126. Forbes, 1924: 146, 151. Riley & Gabriel, 1925: 50. Talbot, 1932b: 201. Bryk, 1937: 487. Forbes, 1940: 311-312. Fox, 1940: 182. Forbes, 1942: 29. Fox & Fox, 1947: 184. Beebe, 1950: 60. d'Almeida, 1951: 7, 9, 17.

The holotype and allotype are from Bogotá, Colombia, numbers 7078 and 7079; a male and four female paratypes are from Venezuela, numbers 7080 to 7084, all in British Museum (Natural History). Paratype number 7084 is, however, *M. polymnia doryssus* Bates.

This subspecies is distributed in the northern half of Colombia and eastward in northern Venezuela. The single record from British Guiana is possible but doubtful.

It is difficult to understand why *veritabilis* has always been associated with *doryssus*. The resemblance is quite superficial; the shape of the comma mark on the forewing is not at all the same in the two (figs. 69A, D). Lighter specimens of *veritabilis* differ but

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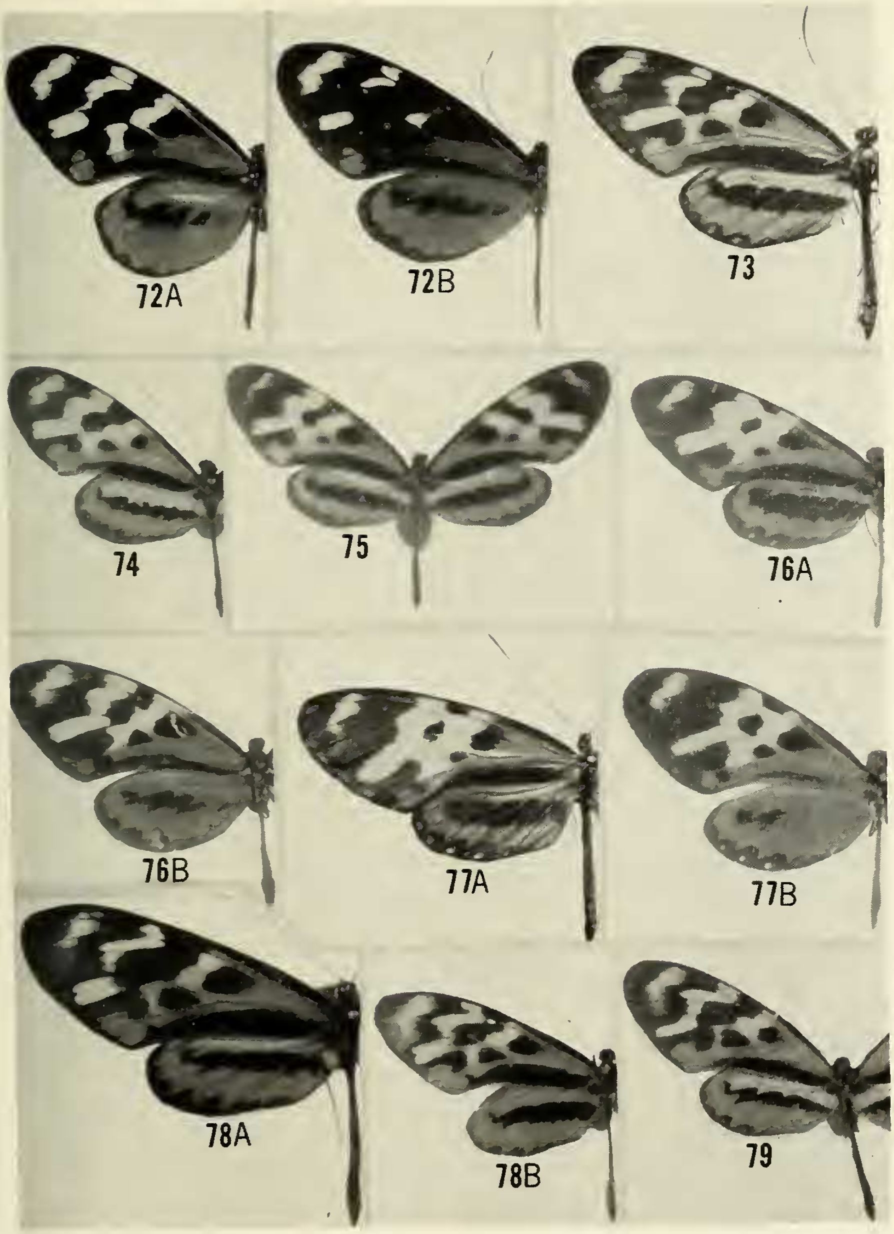
Figs. 72-79. Fig. 72, *M. i. isthmia* Bates; fig. 72A, a light individual, fig. 72B, a dark individual, both ♀, Arrayo Sayazché, Guatemala. Fig. 73, *M. i. veritabilis* Butler, holotype ♂, Bogotá, Colombia, BM. Fig. 74, *M. i. bolivarensis* new subspecies, paratype ♂, La Veulta, Bolívar, Venezuela, CM. Fig. 75, *M. i. kayei* new subspecies, holotype ♂, Mt. Michael, Trinidad, CM. Fig. 76, *M. i. caucaensis* Haensch; fig. 76A, ♂, fig. 76B, ♀, Santa Cecelia, Caldas, Colombia, CM. Fig. 77, *M. i. chimborazona* Bates; fig. 77A, holotype ♂,



Chimboraza, Ecuador, BM; fig. 77B, ♀, Cojimies, Manabi, Ecuador, CM. Fig. 78, *M. i. doryssides* Staudinger: fig. 78A, lectotype ♂, Jurimaguas, Peru, ZMH; fig. 78B, ♂, Lago Yarina-Cocha, Loreto, Peru, CM. Fig. 79, *M. i. eurydice* Haensch, ♂, San Pedro, Peru, CM. Natural size.

little from *isthmia* populations from the northern part of the latter's distribution; the principal difference between them is that in *i. isthmia* the comma mark and the hindmarginal bar are connected by a strong black vertical bar (anal bar) in Cu_2-A, cutting off a tawny spot in the anal angle, while in *i. veritabilis* the anal bar almost always fails to reach the comma mark (a small percentage of exceptions occur) and generally is only a low bump on the tip of the hindmarginal bar or else is entirely absent, so that the tawny area in the anal angle is continuous with the proximal ground color. The populations from Trinidad and from south of the Orinoco previously have been referred to *veritabilis,* but are here separated as subspecies and named below.

Specimens examined, 377 ♂, 371 ♀:

Colombia: **Magdalena:** Aracataca, Bonda, Cacaquilito, Don Amo, Don Diego, Rio Frío, Magdalena, Makaska (?), Manaure, Onaca, Santa Marta Mts., 39 ♂ 20 ♀ (BM, CM, MCZ, RM). **Norte de Santander:** Ocaña district, 1 ♂ (BM). **Antioquia:** Casabe, Frontino, Rio Guayabita, Puerto Berrío, Valdivia, Antioquia, 8 ♂ 1 ♀ (AMNH, BM, ZSB). **Santander:** Quebrada Armas, Cazabe, Rio Cocorná, El Jordan, Landázuri, Muzo, Rio Opón, Porvenir, Timitara (Rio Opón), 58 ♂ 51 ♀ (AMNH, BM, CAS, CM, JHM). **Caldas:** La Dorado, 1 ♀ (ZSB). **Tolima:** Viotá, 3 ♂ 1 ♀ (CM, RM). **Cundinamarca:** Bogotá and mountains near Bogotá, Choachí, Purnio, Quindío, 9 ♂ 17 ♀ (AMNH, BM, CM, RM). **Huila:** Neiva, 1 ♀ (RM). **Meta:** Apian, Buenavista, Cuchilla, Forzosa, Rio Guamal, Rio Guatiquía, Guayabetel, Rio Guayuriba, Laboradorio, Manzanares, Monte Carlo, Rio Ocoa, Peperital, Cano Quenane, Cordiliera Rusio, Llanos de San Martín, Susumuco, Villavicençio, 72 ♂ 93 ♀ (AMNH, BM, CAS, CM). **Vague:** Bogotá to Buenaventura, Hondo, Interior, Magdalena valley, La Vega, Colombia, 49 ♂ 35 ♀ (AMNH, BM, CM, MCZ).

Venezuela: **Zulia:** Las Cruces (near Colón), 1 ♀ (BM). **Mérida:** Mérida, Mucuchachí (as "Munchuchachi"), 3 ♂ 6 ♀ (BM). **Barinas:** Barinitas, 3 ♂ (JHM). **Carabobo:** Carabelleda, 3 ♂ 1 ♀ (JHM). **Aragua:** Colonia Tovar, Las Delicias, Maracay, Pie de Cerro, Puerto Cabello, Las Quiguas, Rancho Grande, San Esteban, 49 ♂ 70 ♀ (AMNH, BM, CM, JHM, RM, ZSB). **Dist. Federal:** Caracas, La Guaira, El Limón, Puerto la Cruz, 19 ♂ 15 ♀ (AMNH, BM, CM, RM). **Guarico:** San Fernando Apure, 1 ♀ (BM). **Sucre:** Cariaquito, Carúpano, Patao (near Guiria), 4 ♂ 5 ♀ (BM, CM). **Monagas:** Caripito, 23 ♂ 21 ♀ (AMNH). **Delta Amacuro:** Tucupita, 5 ♂ 2 ♀ (AMNH, JHM). **Vague:** Venezuela, 19 ♂ 10 ♀ (BM, CM, MCZ).

Guyana [possible but doubtful]: no station, 1 ♂ (BM).

Errors: Chiriqui, Central America, Obidos, Pará, Brazil, West Indes,

northeastern Peru, 10 ♂ 15 ♀ (AMNH, BM, CM, MCZ, ZSB).
No Data: 4 ♀ (AMNH).

Mechanitis isthmia bolivarensis new subspecies (Figs. 71, 74)

? *Mechanitis polymnia*, Forbes, 1942: 29.

The *isthmia* populations in the state of Bolívar, Venezuela, south of the Orinoco, differ consistently from *i. veritabilis* found in northern Venezuela. Apparently this new subspecies was mistaken for *polymnia* by Forbes (1942), which it certainly resembles, but differs in that the discocellular spots of the forewing are always fused into a bar, the black apical area contains a prominent yellow spot, Cu_1-Cu_2 between the comma mark and the cubital spot is bright yellow (except for a few females of *bolivarensis*) and on the hindwing of males the area above the median band is yellow (except in one male seen).

From *isthmia veritabilis, bolivarensis* differs in that on the forewing the discocellular spots, though fused, do not reach the comma mark and or form a continuous band with it, the space in Cu_1-Cu_2 is yellow between the comma mark and the cubital spot, the cubital spot and the spot in the cell are both smaller on the average, on the hindwing the black median band is somewhat narrower and is preceded by a strongly yellow area, the white marginal dots are stronger and often pure white, and on both wings the tawny ground color is paler.

Holotype ♂, *allotype* ♀: Rio Suapure, [Bolívar, Venezuela]; 9-iii-1899 and 27-ii-1899, respectively, [probably S. Klages], in American Museum of Natural History.

Paratypes: 74 ♂, 31 ♀:

Venezuela: **Bolívar:** Rio Caura, 3 ♂ (BM); Cuidad Bolivar, 3 ♂ 1 ♀ (BM); Rio Clarito, 4 ♂ 2 ♀ (CM, JHM); El Pao Mine, 10 ♂ 5 ♀ (CM, JHM); Maripa (Rio Caura), 6 ♂ (BM, CM); Camp Palua (near San Félix), 3 ♂ (AMNH); Rio Retumba, 2 ♂ 7 ♀ (CM, JHM); Rio Suapure, 16 ♂ 13 ♀ (AMNH, BM, CM, MCZ); La Unión (Rio Caura), 7 ♂ (BM); La Vuelta (Rio Caura), 15 ♂ 1 ♀ (BM, CM). **Not located:** Maraval, 3 ♂ 1 ♀ (BM).

Colombia: **Vichada:** Maipures (upper Rio Orinoco), 2 ♂ 1 ♀ (BM).

Other specimens examined, 2 ♂ 3 ♀:

Error: Bogotá, 2 ♂ 2 ♀ (CM).

No data: 1 ♀ (MCZ).

Mechanitis isthmia kayei new subspecies (Figs. 71, 75)

Mechanitis polymnia veritabilis, Kaye, 1904: 163. Guppy, 1904: 227. Kaye, 1921: xi, 16.

The Trinidad population of *M. isthmia* resembles *M. i. veritabilis,* but differs in being smaller, with a slightly more yellowish-tawny ground color, a smaller and narrower yellow apical spot on the forewing and the black discocellular bar usually does not reach the comma mark. It differs from *M. i. bolivarensis* in that the space between the black cubital spot and the comma mark of the forewing is tawny, at most with slight yellowish scaling, rather than clear yellow, as well as in the generally smaller size, the smaller forewing apical spot and the tawny or only slightly yellowed hindwing discal area above the median band.

Holotype ♂ and *allotype* ♀: Mt. Michael, Trinidad; M. G. Netting, 15-ix-1927, a pair taken *in copulo*; in Carnegie Museum.

Paratypes: 120 ♂, 220 ♀:

TRINIDAD: Belmont (Port of Spain), 1 ♀ (BM); Botanical Gardens, (Port of Spain), 4 ♂ 2 ♀ (AMNH); Carenage, 6 ♂ 4 ♀ (CM); Capara valley, 9 ♂ 12 ♀ (BM); Rio Clara, 2 ♀ (JHM); Dabadie, 3 ♂ 2 ♀ (AMNH); Fondes Amandes, 3 ♂ 2 ♀ (AMNH, JHM); Guayaguayare, 1 ♀ (JHM); Hololo Mountain Road (St. Ann's parish), 1 ♂ 3 ♀ (AMNH); Lady Chaviellong Road (St. Ann's parish), 1 ♂ (AMNH); Maynard Road, 1 ♀ (JHM); Mt. Michael, 1 ♂ 2 ♀ (CM); North Range, 1 ♀ (BM); Parrylands, 1 ♀ (JHM); Piarcs Field, 1 ♂ 1 ♀ (AMNH); Polo Sero, 1 ♂ 1 ♀ (AMNH); Port of Spain, 2 ♂ 11 ♀ (AMNH, BM, MCZ, RM, ZSB); Sans Souci Estates, 2 ♂ 1 ♀ (JHM); Santa Cruz valley, 2 ♂ 7 ♀ (AMNH); St. Ann's, 1 ♂ 2 ♀ (JHM); St. George's parish, 1 ♂ (BM); Tabaquite (Narieva district), 3 ♀ (AMNH, BM); West Maynard, 1 ♂ (JHM); Trinidad, 73 ♂ 69 ♀ (AMNH, BM, CM, ZSB).

Other specimens examined, 1 ♂ 1 ♀:

ERRORS: Santarem (Brazil), 1 ♂ (MCZ); British Guiana, 1 ♀ (CM).

Mechanitis isthmia caucaensis Haensch (Figs. 71, 76)

Mechanitis polymnia caucaensis Haensch, 1909: 124 (Caucatal, Col.). Hering, 1925: 188-189. Forbes, 1924: 146, 149, 154. Bryk, 1937: 496-497. Fox, 1940: 182. Forbes, 1948: 13, 17. d'Almeida, 1951: 3, 6, 16.

=*Mechanitis mazaeus septentrionalis,* Forbes, 1948 (not Appolinar): 13, 17. d'Almeida, 1951: 16.

=*Mechanitis polymnia werneri* Hering, 1925: 188 (Choco, Col.). Bryk, 1937: 497. Forbes, 1948: 12, 13, 14, 17. d'Almeida, 1951: 3.

The types of *caucaensis* and of *werneri* are in the Berlin Museum. The pair in the Munich collection from "Caucatal" bear additional labels reading, "Polymnia kommt in dieser formn aller überganzen am ganzen Amazoner im Cauca var. / Species mihi uenditen sub nomine Polymnia!" These notes apparently are in Haensch's hand and the specimens probably are paratypes of *caucaensis.*

This subspecies has heretofore been assigned to *polymnia,* but its range widely overlaps with that of *doryssus,* a *polymnia* subspecies, while the pattern is strongly suggestive of *isthmia,* particularly the fact that in darker individuals the anal bar connects the comma mark and hindmarginal bar on the forewing and cuts off a light spot in the anal angle. In most specimens of *caucaensis* the yellow postmedian fascia on the forewing is quite wide and the black discocellular spots are small and well separated; but in about ten percent of the individuals seen, the discocellular spots are large and fused into a band which reaches the comma mark so that the yellow fascia is greatly reduced in size. The forewing of this dark variation is rather like that of *menapis menapis* from the same geographic area though the shape of the comma mark differs, but the two are easily distinguished by the hindwing: in light specimens of *menapis* the black median band is placed near the marginal band and is much wider toward the apex, while most individuals are dark and have the two bands fused into a large patch; in *caucaensis* the median and marginal bands are separated by a tawny band at least as wide as either and the median band is of even width.

Specimens examined, 172 ♂, 128 ♀:

COLOMBIA: **Choco:** Juntas de Tamaná, 3 ♂ 2 ♀ (BM). **Antioquia:** Frontino, 1 ♀ (BM). **Caldas:** Rio Armas, Quebrada Jamarraya, Quebrada Mumbú, Pereira, Pueblo Rico, Santa Cecilia, 113 ♂ 31 ♀ (AMNH, BM, CM, ZSB). **Valle de Cauca:** Buenaventura, Cali, Rio Dagua, Espejuelo, Rio Frio, Hacienda Garcia, Quebrada Seco, 14 ♂ 13 ♀ (AMNH, BM, CAS). **Nariño:** Popayán, Ricaurte, 1 ♂ 1 ♀ (AMNH, CM). **Vague:** Cauca, Caucatal, "Interior", Santa Rita, Bogotá to Buenaventura, "Colombia", 41 ♂ 77 ♀ (AMNH, BM, CM, MCZ, ZSB).

ERRORS: Santa Catharina, Brazil, 1 ♀ (BM); Truxillo, Honduras, 1 ♀ (AMNH); Medina (Boyoca, Col.) 1 ♀ (RM).

NO DATA: 2 ♂ 6 ♀ (AMNH, BM, CM, MCZ).

Mechanitis isthmia chimborazona Bates (Figs. 71, 77)

Mechanitis chimborazona Bates, 1864: 33 (footnote) (Chimborazo, Ecuador). Kirby, 1871: 24. Haensch, 1909: 124. Seitz, 1910: 166 (as *chimborazana*). Forbes, 1924: 146, 149. Bryk, 1937: 497. Fox, 1940: 182. Forbes, 1948: 13, 14, 15.

? *Mechanitis doryssus,* Dognin (not Bates), 1891 [1887-1896]: 33. Campos, 1927: 8.

The holotype male, number 7029, allotype female, number 7030 and four male paratypes, numbers 7031-7034, are in British Museum (Natural History).

This subspecies is very close to *M. i. caucaensis* but the median bar of the hindwing is obsolete, or nearly so, on the underside in males and in females is abbreviated on both sides with only the distal end remaining. Individual variation is not great and principally affects the markings at the anal angle of the forewing, where a tawny spot may or may not be cut off by the anal bar.

While *chimborazona* is well known from the Pacific slopes of Ecuador, a certain number of records at hand suggest that it may be continuously distributed along the coast of Colombia as far north as the state of Choco, though apparently at altitudes much nearer sea level than the stations where *caucaensis* has been found.

Specimens examined, 200 ♂ 152 ♀:

COLOMBIA: **Choco:** Pizarro, 1 ♂ 1 ♀ (AMNH). **Cauca:** Munchique, 1 ♂ (AMNH). **Nariño:** Victoria, 1 ♂ (CM). **Vague:** "Côtes de Colombie" [Dognin], New Granada, Colombia, 1 ♂ 4 ♀ (AMNH, BM).

ECUADOR: **Esmeraldas:** San Mateo, 9 ♂ 6 ♀ (ZSB). **Imbabura:** Paramba, 2 ♂ 2 ♀ (BM). **Manabi:** Cojimies, Palmar, Rio San Marco, 116 ♂ 75 ♀ (AMNH, CM, ZSB). **Los Rios:** La Chima, Playas de Montalvo, Quevedo, Hacienda Santa Ana Maria (near Quevado), 7 ♂ 11 ♀ (AMNH, BM, RM). **Guayas:** Rio Daule, Guayaquil, Naranjal, La Puntilla, El Triunfo, 21 ♂ 13 ♀ (CM). **Chimborazo:** Chimborazo, Huigra, 30 ♂ 28 ♀ (BM, CM, JHM). **Cañar:** Cañar, 2 ♂ (CM). **El Oro:** Arenillas, El Oro, 1 ♂ 3 ♀ (BM, CM). **Loja:** [west of] Zamora, 1 ♂ 2 ♀ (BM). Ecuador, 7 ♂ 6 ♀ (BM, MCZ). **Error:** Banos, 1 ♀ (RM).

Mechanitis isthmia doryssides Staudinger (Figs. 71, 78)

Mechanitis doryssides Staudinger, 1884 [1884-1888]: pl. 28. 1885 [1884-1888]: 62 (Yurimaguas, Peru). Haensch, 1905: 147; 1909: 126. Forbes, 1924: 146, 152. Bryk, 1937: 487-488. Fox, 1940: 182. d'Almeida, 1951: 6, 8, 17.

=*Mechanitis travassosi* d'Almeida, 1951: 11-12; pl. 2, figs. 1, 2 (Acre, Brazil).
=*Mechanitis doryssus proceriformis* Bryk, 1953: 30 (Roque, Peru).

The type series of *M. doryssides* is in the Berlin Museum and consists of four males bearing labels reading "Jurimag. Peru, Hhl." One of these males is designated as lectotype, the other three as paralectotypes, and I have so labelled the specimens. d'Almeida based *M. travassosi* on two males and a female from Acre Territory, Brazil; the holotype male is in collection d'Almeida and the allotype female and paratype male are in the Museu Nacional do Bresil, numbers 14095 and 14092. I have examined the holotype male of *M. d. proceriformis*, which is in the Swedish Museum, Stockholm.

Distribution of this subspecies includes Caquetá, Amazonas and Putumayo, Colombia, an apparently narrow strip of Brazil on the Solimões and south into Acre, and a greater part of Loreto, Peru. Only the availability of long series from five localities — Rio Orteguaza, Caquetá, Colombia (1° N, 75° W), 53 ♂ 5 ♀; Caucayá, Putumayo, Colombia (0° , 75° W), 64 ♂ 18 ♀; Rio Tacaná, Amazonas, Colombia (2° S, 72° W), 44 ♂, 42 ♀; Iquitos, Peru (3° 45′ S, 73° 20′ W) 32 ♂ 45 ♀; Lago Yarina-Cocha, Loreta, Peru (8° S, 75° W), 86 ♂ 31 ♀ — has made possible an evaluation of the range of variation and an appreciation of the fact that the extremes are connected by even gradations and belong together. Had I seen only a few short series, no doubt I would have found several species present.

At one extreme of variation, the apex of the forewing has a small spot which is clear yellow on the upperside and only slightly margined with orange on the underside; this kind of individual is commoner to the north and makes up about 10% of the series from Rio Ortegazua and Cacayá, about 5% of the series from Rio Tacaná, a bit less of the series from Iquitos and does not occur in the series from Lago Yarina-Cocha. The majority of all series are an intermediate variation which agrees with Staudinger's (1884) figure, and the apical patch on the forewing is of moderate size, yellow anteriorward and orange posteriorward. A small number of specimens in all populations have the apical patch greatly enlarged, running down along the outer margin to or even beyond the comma mark, and this gives a strikingly different "look" to such insects; d'Almeida's *M. travassosi* is of this kind, a variation which is more frequent in the southern and eastern part of the range and less frequent to the north and west. Furthermore, a few specimens seen have the yellow postmedian fascia of the forewing replaced with tawny ground color, a variation which can be separated from some forms of *M. egaensis* only by the shape and proportion of the discocellular spots.

In contrast to *veritabilis, doryssides* has the distal edge of the forewing postmedial fascia acutely angled, but in most other respects the two are rather similar.

Specimens examined, 415 ♂, 302 ♀:

COLOMBIA: **Caquetá:** Rio Orteguaza, 53 ♂ 5 ♀ (AMNH, CM). **Putumayo:** Caucayá, Mocoa, Puerto Limón, 89 ♂ 44 ♀ (AMNH, CM). **Amazonas:** Rio Cotuhé, Florida, Leticia, Loreto-yacu, Macayacu (?), lower Rio Putumayo, Isla la Rondo, Rio Tacaná, Tarapacá, 76 ♂ 74 ♀ (AMNH, BM, CM, RM). **Vague:** Colombia, 1 ♀ (MCZ). **Error:** Muzo, 1 ♂ (ZSB).

BRAZIL: **Amazonas:** Benjamin Constant, São Jōas (Rio Solimões), São Paulo de Olivençia, Teffé, no station, 12 ♂ 27 ♀ (AMNH, BM, CM, JHM). **Acre:** Rio Jurúa, 1 ♂ (AMNH). **Error:** Pará, 1 ♀ (AMNH).

PERU: **Loreta:** Achinamiza, Rio Aquaytia, Caballococha, Rio Cachiyacu, Iquitos, Maquea, Rio Marañon, Rio Napo, Rio Pacaya, Pampa Hermosa, Pébas, Pucallpa, Requena, Rio Ucayali, Rio Utoquinia, Lago Yarina-Cocha, Yurimaguas, 172 ♂ 134 ♀ (AMNH, BM, CAS, CM, MCZ, RM, ZSB). **San Martín:** Juanjui, Moyabamba, Pachisa, Rioja, 4 ♂ 5 ♀ (AMNH, RM). **Huánuco:** Pachitea, 1 ♂ (MCZ). **Vague:** northeast Peru, Peru, 6 ♂ 7 ♀ (AMNH, BM, ZSB).

NOT LOCATED: "Puajango, Haute Amaz.", 3 ♀ (BM).

NO DATA: 1 ♀ (AMNH).

Mechanitis isthmia eurydice Haensch (Figs. 3-10, 71, 79)

Mechanitis eurydice Haensch, 1905: 147; fig. 4 (Hillipani, Peru); 19-9: 126. Forbes, 1924: 146, 147, 148, 152, 154, 155; pl. 12, figs. 2, 5, 6. Kremky, 1925: 205, 206-207; text figs. 71, 72, 73, pl. 22, fig. 6. Bryk, 1937: 488. Fox, 1940: 182. d'Almeida, 1951: 8, 9, 17.

[*Mechanitis lycidice eurydice* "argentea" Prüffer, 1922a: 5; pl. 2, fig. 3 (Rio Maranon above Iquitos).] Kremky, 1925: 207. Bryk, 1937: 488.

= *Mechanitis doryssus argentea* Fox, 1940: 182. Forbes, 1948: 10-11. d'Almeida, 1951: 8, 9, 17.

The types of *M. eurydice* are in the Berlin Museum. The types of *argentea* may be (or have been) in the Warsaw Museum, but the question is of little importance as the name was proposed as a quadrinomial and would not be available, except that I inadvertently treated it as a trinomial in a list of *Mechanitis* (1940).

Like *doryssides*, the outer edge of the forewing postmedian fascia is deeply angled, the discocellular spots are enlarged and connected and usually touch the comma mark; unlike *doryssides*, *eurydice* has no orange or tawny in the forewing apical spot, has the end of the discal cell and the ground color in Cu_1-Cu_2 bright yellow and has the black bands of the hindwing narrow. The area above the hindwing median band is often, but by no means invariably, yellow. Forbes (1948) thought that the absence of yellow in the hindwing cell ("argentea") is characteristic of the periphery of distribution; while this is true in a general way, individuals with yellow and some without yellow in the forewing cell are found in any series if it is sufficiently representative.

During January, 1955, E. I. Schlinger and E. S. Ross of the California Academy of Sciences found a number of eggs of *M. i. eurydice* and successfully brought them through to maturity. Dr. Ross kindly sent me the photographs of this operation made in the field and they are reproduced here with his permission (figs. 3-10). Attention again is called to the nymphaloid pupa and the characteristic larva.

Specimens examined, 105 ♂, 110 ♀:

ECUADOR: **Oriente:** Riobamba, no station, 2 ♀ (AMNH, RM).

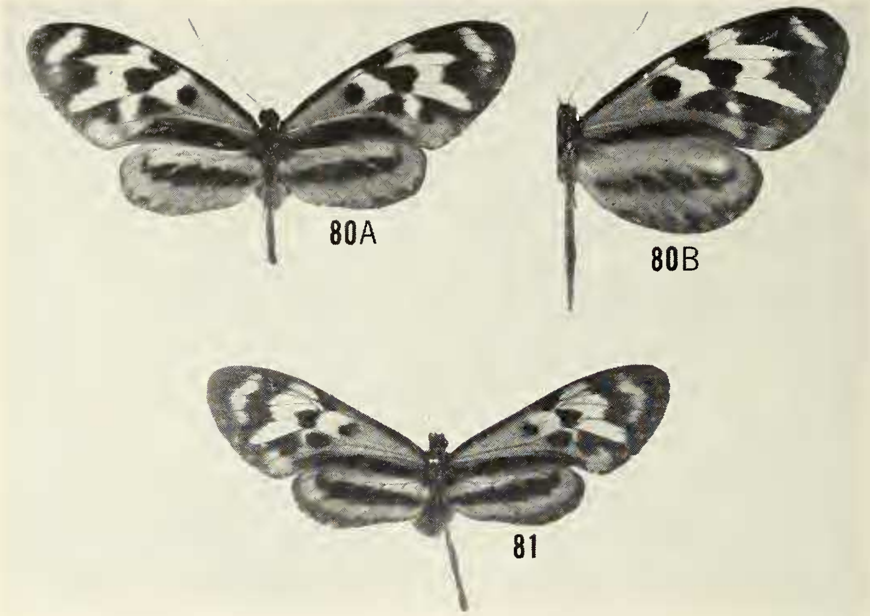
PERU: **Cajamarca:** Rio Chinchipe, 1 ♂ 2 ♀ (BM). **Amazonas:** Rio Cenipa, Rio Charapa, Quebrada Huanchinza, San Pedro, 11 ♂ 3 ♀ (AMNH, BM, CM). **Loreto:** Achinamiza (error?), Rio Cushabatay, Isla Sama, 3 ♀ (AMNH, RM). **San Martín:** Bellavista, Juanjui, Tarapoto, 7 ♂ 3 ♀ (AMNH, BM). **Huánuco:** Tingo Maria, 17 ♂ 27 ♀ (AMNH, CZS, CM, MSU, ZSB). **Junín:** Rio Colorado, Colonia Perené, Rio Perené, La Merced, San Ramón, Satipo, 13 ♂ 15 ♀ (AMNH, BM, CAS, CM, RM, ZSB). **Cusco:** Rio Chanchosmayo, Illapani, Rio Oxapampa, Rio Paucartambo, Quillabamba, 50 ♂ 49 ♀ (AMNH, BM, RM, ZSB). **Not located:** Guayajaugo, Rio Sharro, 3 ♀ (BM, ZSB). **Vague:** Peru, 2 ♂ 2 ♀ (AMNH, BM).

BOLIVIA: Cochabamba, no station, 3 ♀ (AMNH, RM).

NO DATA: 2 ♂ (BM, CM).

Mechanitis lanei

For many years I had been perplexed by a female from Peixe Boi, Pará, Brazil, in the Academy of Natural Sciences of Philadelphia. The peculiar pattern and coloring led me to suppose that it might be an aberrant individual, but I could not reconcile it with any of the species known from Pará. Even by assuming an erroneous locality



Figs. 80-81. Fig. 80, *M. lanei* new species; fig. 80A, paratype ♂, Igarapé-Açu, Pará, Brazil, CM; fig. 80B, allotype ♀, Peixe Boi, Pará, Brazil, CM. Fig. 81, *M. limnaea* Forbes, ♂, St. Jean, French Guiana, USNM. Natural size.

label it was impossible to associate it, though it seemed to be closer to *isthmia* than to any other species.

While arranging the genus in British Museum (Natural History) in early 1965 I came across, under various names, nine males and two females having precisely the same peculiarities and from the same limited geographic area. Study of this series demonstrated slight but consistent differences in male genitalia, female forelegs and the venation of both wings and clearly indicated why there had been difficulty in assigning the Peixe Boi female to any known species of *Mechanitis*.

Mechanitis lanei new species (Figs. 63, 69B, 71, 80)

It is a pleasure to name this remarkable Brazilian *Mechanitis* in honor of my friend, Professor Frederico Lane, a remarkable Brazilian scientist.

Antennae yellow-tawny with the basal tenth black. Palpi yellow with the terminal segment black. Length of one forewing, 32-34 mm. in males, 37-39 mm. in females. General appearance of pattern and coloring somewhat resembling *isthmia eurydice* and light specimens of *isthmia isthmia* (*i.e., lycidice*).

MALE (fig. 80A). *Forewing.* — apical area black, containing a narrow translucent creamy white subapical spot; postmedial fascia translucent creamy white, its outer edge deeply zigzag with the element in M_1-M_2 occupying more than half the cell and its distal end pointed, the element in M_2-M_3 much shorter though as wide as the discocellular spot preceding it, the element in M_3-Cu_1 extending nearly to the margin along Cu_1 and its acute tip sloped diagonally back and up to M_3; discocellular spots fused proximad, the upper spot rectangular, the lower formed like a recumbent heart and occupying the bases of M_2-M_3 and M_3-Cu_1; comma mark sharply limited anteriorward by Cu_1 (but in some specimens a small creamy white spot is present just under the vein and near the margin), and the black coloring extends, at least narrowly, along the vein to the lower corner of the discocellular spot; triangular cubital spot as large as lower discocellular spot, only very narrowly separated from it and extending out along Cu_2 to or almost to the head of the comma mark, thus isolating a round or oval translucent creamy white spot in Cu_1-Cu_2; hindmarginal bar well developed, though varying in width, and extending from the base to the anal angle, but leaving a narrow tawny band along the margin itself; anal bar generally strong and usually connecting the comma mark and hindmarginal bar to isolate a tawny spot in the anal angle; discal cell spot round, isolated, the cell beyond it the same color as the postmedian fascia; basal half of discal cell and much of Cu_2-A tawny, about the same color as is found in *i. eurydice*; costal and outer margins black, the submarginal spots faintly indicated in the outer margin, especially at the apex.

Hindwing. — Marginal band narrow, deeply scalloped at the veins and lightly so between them with the submarginal spots greyish white; median band fairly broad (3-4 mm.) but placed well away from the discal cell, leaving a tawny area below it of about the same width; proximal of the median band the wing is tawny and slightly translucent.

Beneath as above, but the submarginal spots stronger and white on both wings, the median band of the hindwing weaker and broken into a series of triangular elements between the veins and a narrow black bar extending over R from base to apex.

FEMALE (fig. 80B). — Like the male, but the black markings in the anal angle of the forewing tend to be heavier and on the hindwing the median band is broken by the tawny veins on the upper as well as the under side, the discal area is less translucent except for a spot in M_1-M_2 and the black bar over R extends to the costal margin, leaving only the humeral area creamy tawny.

In the male genitalia the penis is proportionately longer than in *isthmia* and the valves are slightly narrower. The second foretarsal subsegment of the female (fig. 63) bears the inner spine and is longer than the third subsegment, the latter being proportionately shorter than in *isthmia*.

Venation. — On the male forewing, M_1 arises well away from the discal cell, just proximal of the origin of R_2, at a distance a little more than the length of 2d, though much less than that of 3d; the male hindwing has venation typical of *Mechanitis*. In the female M_1 of forewing and M_1 of hindwing both arise farther from the cell than is true in *isthmia*.

Holotype ♂. — Iguarape-assu [Igarape Açu], Pará [Brazil]; W. Hoffmann, 1905; *ex* Rothschild collection in British Museum (Natural History).

Allotype ♀. — Peixe Boi, east of Pará [Brazil]; H. B. Merrill, Nov.-Dec., 1907; *ex* Academy of Natural Sciences of Philadelphia in Carnegie Museum.

Paratypes. 8 ♂, 2 ♀:

BRAZIL: **Pará:** Iguarape-assu [Igarape Açu], 4 ♂ 2 ♀ (BM, CM); Pará, 2 ♂ (BM). **Maranhão:** Mt. Aureos, 1 ♂ (BM); Maranham [Maranhão], 1 ♂ (BM).

Mechanitis limnaea

The markings are distinctive, particularly the discocellular spots, the comma mark, the shape of the outer edge of the postmedian fascia and the position of the hindwing median band. The discal cell spot is present in some specimens. The shape of the comma mark and the translucency of the forewing fascia are reminiscent of *M. lanei* and the female foretarsus has also a spine on the inner side of the second subsegment, but there the similarity ends. *M. limnaea* appears to be closest to *polymnia*, as Forbes thought, and a specimen taken by H. W. Bates, now in the British Museum (Natural History) was identified by its collector as *polymnia*.

Mechanitis limnaea Forbes (Figs. 69C, 71, 81)

[*Mechanitis mantineus* "variety", Forbes, 1924: 146, 156.]
Mechanitis limnaea Forbes, 1930: 317-318 (Maroni River, French Guiana). 1948: 12, 20; pl. 1, fig. 8.
=*Mechanitis mantineus forbesi* Bryk, 1937: 491-492.

The holotype male and two paratypes are in Cornell University from St. Laurent, Maroni River, Cayenne, and another paratype in the same collection is from Moengo, Cottica River, Surinam; a female paratype in U. S. National Museum is ticketed only "French Guiana".

Of the nineteen specimens known to me, one came from British Guiana, twelve from Cayenne, one from Surinam and three from Pará on the lower Amazon, with two bearing no data: these localities suggest the area of distribution.

Specimens examined, 10 ♂, 4 ♀:

GUYANA: Berbica, 1 ♂ (BM).

FRENCH GUIANA: St. Jean, no station, 5 ♂ 3 ♀ (AMNH, BM, PM, USNM).

BRAZIL: Pará: Obidos, Villa Nova, Pará, 2 ♂ 1 ♀ (BM).

NO DATA: 2 ♂ (BM).

Mechanitis polymnia

The similarities with and differences from *M. isthmia* have been discussed previously. The first thought of the early lepidopterists and of many since, upon finding a new *Mechanitis*, has been to call it a *polymnia* "form". Forbes (1924, 1948) distinguished *polymnia* from *mazaeus* by the fact that in the former the forewing discocellular spots are of about equal size, and in the latter the lower discocellular spot is the larger. The distinction is valid, even though some *isthmia* also have both spots equal, while *mazaeus* as conceived by Forbes is really three species. Forbes also laid stress on the marginal series of the hindwing, noting that the elements tend to be elongated and proximally smudged in "mazaeus", but shorter and sharply limited in *polymnia*; this difference, too, is valid in main, but many females of *polymnia* in the Amazon valley have elongated, smudged marginal spots.

There are five subspecies (figs. 82, 83): *p. doryssus* is distributed from Mexico into northern Colombia and west through most of northern Venezuela; *p. solaria* is found in extreme northeastern Venezuela and on Trinidad; *p. polymnia* is found in Bolívar, Venezuela, throughout the Guianas and in the entire Amazon valley, and is everywhere quite variable; *p. angustifascia* is distributed from eastern and southern Peru through Bolivia and southwestern Brazil to Mato Grosso; *p. casabranca* occupies the southeastern part of Brazil.

Mechanitis polymnia doryssus Bates (Figs. 68, 69D, 82, 83, 84)

Mechanitis doryssus Bates, 1864: 33 (San Geronimo, Guatemala). Kirby, 1871: 24. Butler & Druce, 1874: 334. Godman & Salvin, 1879 [1879-1901]), 1: 21; pl. 1, figs. 9, 10. Weymer, 1890: 9, 26. Therese von Bayern, 1901: 247. Godman, 1901 [Godman & Salvin, 1879-1901], 2: 642. Moulton, 1909: 587; pl. 30, Figs. 3, 4.

Haensch, 1909: 125-126; pl. 33f. Forbes, 1924: 146, 147, 148, 152, 154, 155; pl. 12, fig. 1. Riley & Gabriel, 1925: 17. Kremky, 1925: 208. Bryk, 1937: 486. Fox, 1940: 182. Hoffman, 1940a: 635. 1940b: 664. Lichy, 1943: 209. Forbes, 1948: 13.

=*Mechanitis utemaia* Reakirt, 1866: 241 (Honduras). Kirby, 1871: 24 (as *utenaia*). Godman & Salvin, 1879 [1879-1901], 1: 21. Haensch, 1909: 126 (as *utenaia*). Forbes, 1924: 146, 152 (as *utenaia*). Bryk, 1937: 487. Fox, 1940: 182. Hoffman, 1940a: 635. 1940b: 664.

=*Mechanitis labotas* Distant, 1876: xii (Costa Rica). Kirby, 1877: 840. Godman & Salvin, 1879 [1879-1901], 1: 21; pl. 4, fig. 1. Godman, 1901 [Godman & Salvin, 1879-1901], 2: 642. Haensch, 1909: 126. Forbes, 1924: 146, 152. Bryk, 1937: 487. Fox, 1940: 182.

=*Mechanitis polymnia*, Huntington, 1934: 196.

[*Mechanitis doryssus utemaia* "extrema" Hoffmann, 1940a: 636; fig. 1 (Mapastepec, Chiapas, Mexico).] 1940b: 664. Forbes, 1948: 11-12.

The holotype of *doryssus* is a male from "San Geronimo", Guatemala and the allotype is a female from Polochic valley, Guatemala, numbered respectively 7097 and 7098 in British Museum (Natural History). The type of *utemaia* is in the Chicago Natural History Museum, from the Streker collection. The types of *labotas* probably are in the British Museum (Natural History), but have not been segregated. These last two names apply to normal variants and must be treated as synonyms, while "extrema" of Hoffmann was proposed as a quadrinomial and has no status.

The distribution is from Mexico south around the Caribbean area to northern Venezuela and thus presents an unusual geographic pattern, as most ithomine subspecies from Central America do not reach the continent. Except for the striking female variant in which only the apical part of the hindwing median band is preserved (*labotas*), which may occur in any part of the range, *doryssus* appears to be quite stable. Since it occupies, in part, the same areas as does *veritabilis*, these two cannot belong to the same species, a fact well supported by the quite differently formed comma marks. In Central America, *doryssus* is commonly confused with *M. menapis saturata,* but in the latter the black markings are much heavier, with the comma mark and

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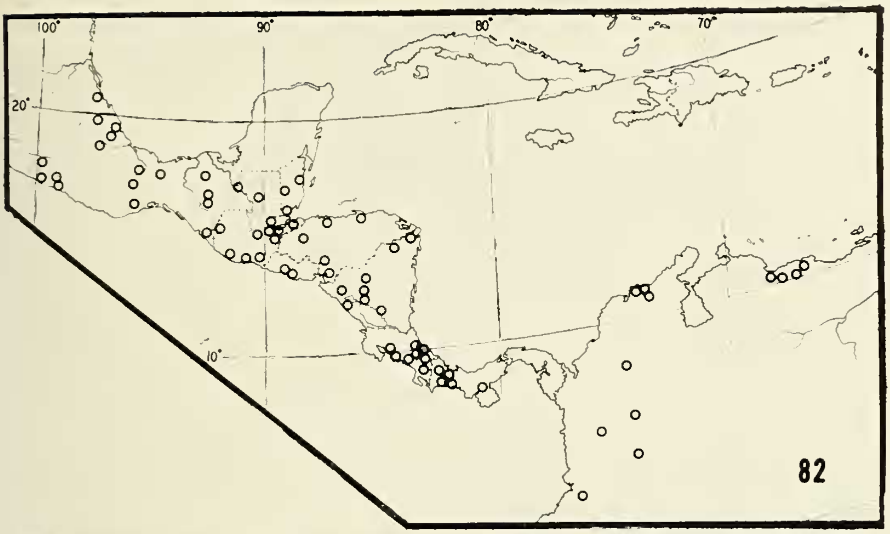
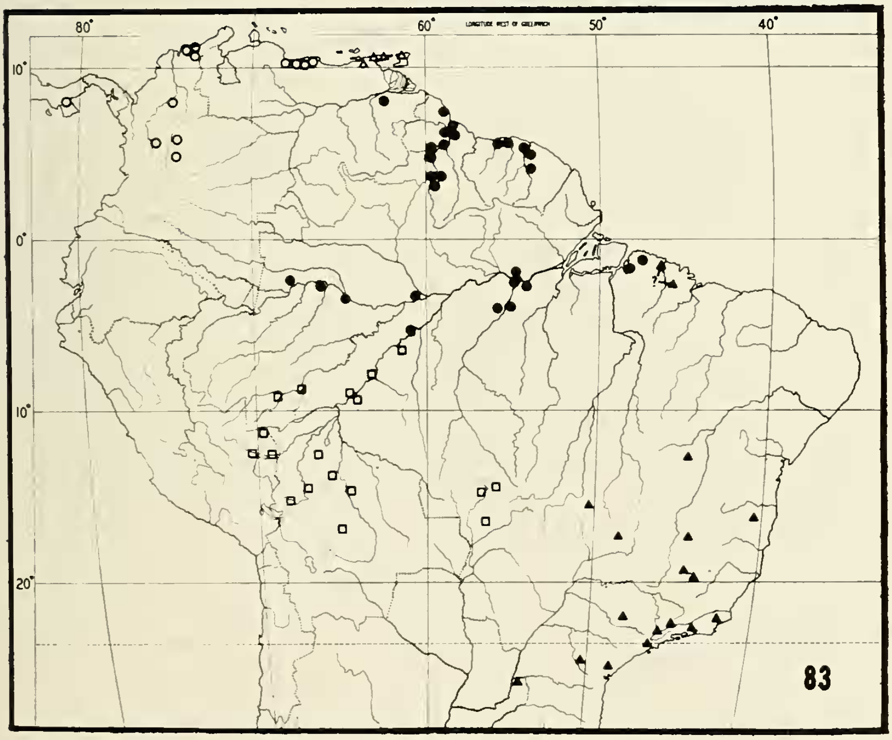
Figs. 82-83, distribution of subspecies of *M. polymnia*. Fig. 82, Central America and northwestern part of South America: open circles, *M. p. doryssus* Bates. Fig. 83, South America: open circles, *M. p. doryssus*; open triangles, *M. p. solaria* Forbes; solid circles, *M. p. polymnia* Linné; open squares, *M. p. angustifascia* Talbot; solid triangles, *M. p. casabranca* Haensch.


100°
90°
80°
70°
20°
10°

82


80°
60°
LONGITUDE WEST OF GREENWICH
50°
40°
10°
0°
10°
20°

83

discocellulars fused into a cross-band, the median band of the hindwing is placed much nearer the marginal band, and the ground color is darker.

Specimens examined: 402 ♂, 345 ♀:

Mexico: **Vera Cruz:** Allende, Atoyac, Catemaco, Córdoba, Huapecal, Misantla, Orizabo, Tecuanapa (as "Tezanapa"), Vera Cruz, 22 ♂ 16 ♀ (AMNH, BM, CM, ZSB). **Guerrero:** Acahuizotla, Ayutla, Chilpancingo, Guerrero, Tierra Colorado, 35 ♂ 26 ♀ (BM, ZSB). **Oaxaca:** Chiltepec, Comaltepec, Oaxaca, 20 ♂ 21 ♀ (BM, CM, JHM). **Tabasco:** Teapa, Tepescuintla, 3 ♂ 2 ♀ (BM, JHM). **Chiapas:** Chiapas, Escuintla, Palenque, Tapachula, 15 ♂ 8 ♀ (AMNH, CM, JHM, ZSB). **Not located:** Montsorongo, 1 ♀ (BM). **Vague:** Isthmus of Tuhuantepec, Mexico, 3 ♂ 6 ♀ (BM, MCZ, ZSB).

Guatemala: Amatitlán, Barranca Honda (?), Bartios (?), Chiacam (?), Cobán, Dartmouth, Gualán, Cuidad Guatemala, Guazacapán, Mirandilla (?), Pacific coast, Piedras Negras, Polochic valley, Puerto Barrios, Quiriguá Veijo, Rabinal, Los Ramones (?), San Jeronímo (as "Geronimo"), Volcan Santa María, Arroyo Sayazché, Tiquizate, Variedades (?), Guatemala, 60 ♂ 48 ♀ (AMNH, BM, CAS, CM, JHM, MCZ).

British Honduras: Belize, Cayo, Middlesex, Punta Gordo, Rio Sarstún, Rio Tomash, 33 ♂ 21 ♀ (BM, CM, JHM).

El Salvador: Los Chorros, San Salvador, Santa Tecla, 6 ♂ 5 ♀ (BM, CAS, JHM).

Honduras: Cantarranas (?), El Portilla (Rio Grande), San Pedro Sula, Tegucigalpa, Tela, Trujillo, Honduras, 20 ♂ 27 ♀ (AMNH, BM, CM, MCZ, RM).

Nicaragua: Camoapa, Chontales, Edén, Jinotega, Managua, Matagalpa, San Ramón (Cabo Gracias á Dios), Rio Wanks, Nicaragua, 39 ♂ 21 ♀ (AMNH, BM, CM, RM).

Costa Rica: Agua Gata mountains, El Alto, Boruca, Carillo, Casajal, Colombiana (?), Escasú, Esperanza, Rio Estrella, Golfito (as "Colombia"), Guápiles, Irazú, Juan Viñas, Moravia, Pozo Azul, Puerto Golfito, Puerto Limón, Puntaremas, San José, Rio Sixaola, Rio Sucio, Tres Rios, Turrialba, Costa Rica, 66 ♂ 58 ♀ (AMNH, BM, CM, HR, RM).

Panama: Alto Lino (Chiriqui), Bajo Boquete, Bugaba, Volcan Chiriquí, David, Lion Hill, Parana (?), Puerto Armuelles, Isla Sevilla, Veraguas, Panama, 23 ♂ 30 ♀ (AMNH, BM, CM, HR, MCZ, ZSB).

Colombia: **Antioquia:** Santa Rita (Rio Cauca), 4 ♀ (BM). **Valle de Cauca:** Cali, 3 ♂ 2 ♀ (BM). **Cundinamarca:** Bogotá, 4 ♂ 1 ♀ (BM, CM). **Boyacá:** Muzo, 1 ♂ (ZSB). **Bolívar:** Juntas (Rio Cauca), 1 ♂ (BM). **Magdalena:** Atánques, Bonda, Cacaquelito (?), Don Amo, Don Diego, Manuare, Minca, Onaca, 22 ♂ 16 ♀ (BM, CM, RM). **Vague:** Colombia, Cauca valley, 1 ♂ 2 ♀ (AMNH, BM, CM).

Venezuela: **Carabobo:** Caraballeda, 2 ♂ (JHM). **Aragua:** Maracay, Las Quiguas, San Esteban, 11 ♂ 10 ♀ (BM, CM). **Dist. Federal:** Caracas, La Guaira, Puerto la Cruz, 3 ♂ 4 ♀ (BM, CM). **Miranda:** Santa Lucía, 1 ♀ (CM). **Not located:** Mortzorango, 1 ♀ (AMNH). **Vague:** Venezuela, 3 ♂ 3 ♀ (BM, CM).

ERRORS: Canelos and Zamora, Ecuador, 1 ♂ 1 ♀ (BM); Pará and Ega, Brazil, 2 ♀ (BM); West Indies, 1 ♀ (MCZ); Peru, 1 ♂ 1 ♀ (RM).

NO DATA: 4 ♂ 6 ♀ (BM, CM, MCZ).

Mechanitis polymnia solaria Forbes (Figs. 83, 85)

Mechanitis polymnia solaria Forbes, 1948: 13, 14, 15; pl. 1, fig. 5 (El Chorro, Sucre, Venezuela).

Mechanitis veritabilis, Kaye (part), 1921: 16.

The type series consists of the male holotype and female allotype from El Chorro, Sucre, Venezuela, in Cornell University, and five females in Carnegie Museum, four from Cumanacoa, Sucre, Venezuela and one from Elvecia, near Mt. Turumquire, Sucre, Venezuela. A substantial number of additional specimens have since been found in various collections and all authentic localities are from Sucre or Trinidad.

The subspecies has the discocellular spots and comma mark formed just as in *p. doryssus*, but the yellow postmedian fascia is wider at the expense of the black apical area, though not always as wide as in the holotype figured by Forbes (1948).

Specimens examined, 16 ♂, 25 ♀:

VENEZUELA: **Sucre:** Buelta Triste, Cariaquito, Carúpano, Cumanacoa, Elvecia, Patao (near Guiria), El Pilar, 11 ♂ 16 ♀ (BM, CM). **Vague:** Venezuela, 2 ♂ 2 ♀ (BM).

TRINIDAD: Carenage, Maynard Road, Port of Spain, Trinidad, 3 ♂ 4 ♀ (BM, CM, JHM, MCZ).

ERRORS: British Guiana, 1 ♀ (BM); Brasilia, 1 ♀ (BM); Pará, 1 ♀ (BM).

Mechanitis polymnia polymnia (Linné) (Frontispiece, Figs. 2, 65, 83, 86)

Papilio polymnia Linné, 1758: 466 (Surinam). 1764: 224. 1767: 755. Müller, 1774: 583. Meerburgh, 1789: pl. 23. Cramer, 1777 [1775-1791], 2: 144-145; pl. 191, fig. E. Fabricius, 1781, 2: 28. 1787, 2: 14. Gmelin, 1790, 1: 2249. Herbst, 1790, 4: 109-110; pl. 69, fig. 3. Fabricius, 1793: 164. Rudolphi, 1804: 23. Turton, 1806, 3: 45.

Mechanitis polymnia, Fabricius, 1807: 284. Hübner, 1816 [1816-1826]: 11. 1823 [1806-1838], 1: [15] - [16]. Doubleday, 1847 [1846-1852]: 130. Bates, 1862: 501, 506, 511, 528, 529-531. Butler, 1869: 125. Kirby, 1870: 138. 1871: 23. 1877: 840. Burmeister, 1879a: 122-123. 1879b: 16. Aurivillius, 1882: 41-42. Staudinger, 1885 [1884-1888]: 61. Schatz, 1885 [1885-1892]: pl. 10. 1886 [1885-1892]: 92. Snellen, 1887: 13. Weymer, 1890: 65. Reuter, 1896: 40. Haensch, 1903: 165. Sanders, 1904: 320. Röber, 1904: 105. Kaye, 1907: 421, 430, 432, 433, 435, 436; pl. 23, fig. 3, pl. 24, fig. 2. Haensch, 1909: 124; pl. 33e. Forbes, 1924: 147, 150, 154, 155. Kremky, 1925: 203, 204, 209; figs. 64, 66. Aurivillius, 1929: 155. Lima, 1936: 210. Bryk, 1937: 495-496. Fox, 1940: 181, 182. Forbes, 1940: 312. Fox, 1940: 182. Hall, 1940: 5. d'Almeida, 1942: 189, 190. d'Almeida, 1951: 10. Bryk, 1953: 28.

Nereis polymnia, Hübner, 1807 [1806-1838], 1: [7] - [8]; 1806: pl. 7.

Heliconia polymnia, Latreille [*in* Latreille & Godart, 1819-1823]: 200, 219-220.

=*Mechanitis plagigera* Butler, 1877: 150 (Prainha, Brazil). Haensch, 1909: 125. Riley & Gabriel, 1925: 40. Bryk, 1937: 484. Fox, 1940: 182. Forbes, 1948: 12.

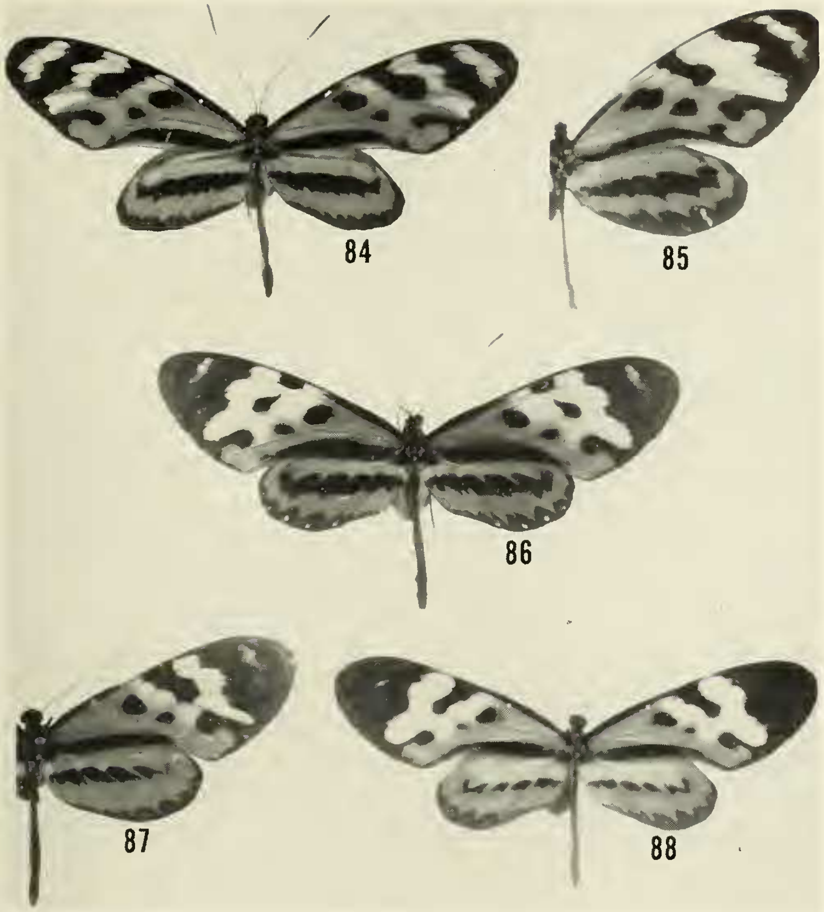
=*Mechanitis polymnia apicenotata* Zikan, 1941: 15 (São Gabriel, Rio Negro, Brazil). d'Almeida, 1956: 1, 2-3; fig. 2.

=*Mechanitis polymnia mauensis* Forbes, 1948: 14, 15-16; pl. 1, fig. 4.

=*Mechanitis mazaeus bipuncta* Forbes, 1948: 17, 19-20; pl. 1, fig. 7 (Surukum basin, Upper Caroni River, Bolivar, Venezuela). d'Almeida, 1951: 3.

= *Mechanitis polymnia sanctigabrielis* Bryk, 1953: 29 (São Gabriel, Rio Negro, Brazil). d'Almeida, 1956: 2-3.

The Linnean type is preserved in the Queen Ludvica Ulrica collection in the Stockholm Museum and, according to Aurivillius (1882), was figured by Hübner (1806 [1806-1838]). The type of *plagigera* is a male from "Prainha, on the Amazon" — the "millionth map" shows five localities of that name on the Amazon, but all are in Pará near the mouth — numbered 7028 in the British Museum (Natural History). The type of *apicenotata* is in the Instituto Oswaldo Cruz, and was figured by d'Almeida (1956). The type series of *mauensis* consists of the holotype male, allotype female and two paratypes, a male and female, all from Santarem, in Cornell University, and a paratype female from Teffé in Carnegie Museum. The types of *bipuncta* are five females from Surukum basin, upper Caroni River, Bolivar, Venezuela, in Cornell University. The type of *sanctigabrielis* is a male from São Gabriel, Rio Negro, Brazil, in the Stockholm Museum.



Figs. 84-88. Fig. 84, *M. p. doryssus* Bates, ♂, El Alto, Costa Rica, CM. Fig. 85, *M. p. solaria* Forbes, paratype ♀, Cariaquito, Sucre, Venezuela, CM. Fig. 86, *M. p. polymnia* Linné, ♂, Chenapowu, British Guiana, CM. Fig. 87, *M. p. angustifascia* Talbot, paratype ♂, Tombador, Mato Grosso, Brazil, CM (*ex* BM). Fig. 88, *M. p. casabranca* Haensch, ♂, Nova Iguassú, Guanabara, Brazil, CM. Natural size.

Forbes noted (1948) that Butler's description of *plagigera* is so inadequate that the name cannot even be assigned to the correct species, an observation which would equally apply to any description of a *Mechanitis* not accompanied by a figure. Examination of the Butler type, however, demonstrated that the insect is a perfectly typical *polymnia*. I have also studied the type of *sanctigabrielis* and found it to be typical *polymnia* and, in fact, (see d'Almeida, 1956) merely the useless redescription under another name of a previously recorded synonymous name from exactly the same locality, Zikan's *apicenotata.*

There was justification for the two Forbes names, as each was based on populations from the extremes of the distribution of *p. polymnia* and the respective type series are more or less atypic. *M. p. mauensis* was applied to a short series with reduced yellow in forewing cell Cu_1-Cu_2 and "apparently slightly broader-winged" than the "typical" form. Having now seen so much *polymnia* material, I find that this is a normal variant in the subspecies occurring to some degree throughout its range rather than a valid subspecies. When he studied the *Mechanitis* populations of Venezuelan-Guiana, Forbes thought that the local *isthmia* subspecies (described herein as *i. bolivarensis*) was a *polymnia* "race", and was thus led to assign *bipunctata* to *mazaeus* — to him, the only alternative — whereas it is really the local *polymnia.* I have found all the distinctive features of *bipunctata* in Guiana specimens, though not all of them together in a single individual. The evidence at hand suggests that the Caroni basin is the western limit of distribution for *p. polymnia* and apparently *bipunctata* is transitional to *p. solaria,* as would be expected of a "frontier" population. For the present I place *bipunctata* as a biological synonym, but it is possible that when Bolívar is more adequately explored, *bipunctata* will be found to be a valid subspecies.

In the vicinity of the Rio Solimões, *polymnia* occurs in two color phases, a yellow tawny ground color and a darker brownish tawny, apparently in about equal numbers. The series of 61 males and 52 females from Teffé in the British Museum includes 32 dark males and 31 dark females. The lighter ground color is the one occurring generally in the subspecies while the darker ground appears to be localized. In passing it should be mentioned that Bates (1862) did not notice these two color forms and, in fact, had no basis for such an observation, since he so completely misunderstood *polymnia* and the biologic processes at work in *Mechanitis.*

Specimens examined: 260 ♂, 299 ♀:

VENEZUELA: Bolívar: El Pao Mine, 1 ♂ (JHM).

GUYANA: Amatuk Falls, Anandubaru, Annai (as Aunai), Chenapowu River, Christianburg, Demerara River, Essequebo River, Kartabo, Malali, Nappi, Omai River, Potaro River, Quongo (?), Tacutú River, Tumatumari, Warina, Wismar, British Guiana, 56 ♂ 53 ♀ (AMNH, BM, CM, RM).

SURINAM: Aroewarwa Kreek, Paramaribo, Saramacca River, Surinam, Dutch Guiana, 28 ♂ 50 ♀ (BM, CM, MCZ, ZSB).

FRENCH GUIANA: Cottica, Maroni Riviére, St. Jean, St. Laurent, Cayenne, French Guiana, 10 ♂ 12 ♀ (BM, CM, RM).

BRAZIL: **Pará:** Belém, Benevides, Bôa Vista (Rio Tapajós), Conceiçãon (Rio Tapajós), Igarapé Açu, Itaituba, Murutucu (Belém), Óbidos, Santarém, Rio Tapajós, Villafranca, Pará, 73 ♂ 62 ♀ (AMNH, BM, CM, JHM, MCZ, ZSB). **Amazonas:** Ilha do Araras (Rio Madeira), Centenário, Fonte Bôa, Manacapurú (Rio Solimões), Rio Negro, Teffé, Riotonatins, East Amazon, 75 ♂ 81 ♀ (AMNH, BM, CM, JHM, ZSB). **Not located:** Barra (which ?), 1 ♀ (BM). **Vague:** Amazons, Brazil, 12 ♂ 26 ♀ (CM, JHM, MCZ, RM, ZSB).

ERRORS: Venezuela, Maracaibo (Venezuela), Cartegena (Colombia), Bogotá (Colombia), Ega (Brazil), Iquitos (Peru), 3 ♂ 8 ♀ (BM, CM, RM).

NO DATA: 2 ♂ 6 ♀ (AMNH, CM, MCZ).

Mechanitis polymnia angustifascia Talbot (Figs. 83, 87)

Mechanitis polymnia angustifascia Talbot, 1928: 411-412; pl. 14, fig. 7 (Rio Serragem, Mato Grosso). Collenette, 1928: 393, 394, 398, 401. Gabriel, 1932: 12. Fox, 1940: 182. Forbes, 1948: 10, 14, 15.
=*Mechanitis polymnia*, Hayward, 1939: 378.

The holo- and allotype are in British Museum (Natural History), numbered 18429 and 18430 respectively, along with 173 paratypes.

Far from being "an isolated colony" (Forbes, 1948), *angustifascia* is a major subspecies distributed from Peru across the southern part of Brazil and the lower areas of Bolivia into Mato Grosso, and is more like *p. casabranca* without yellow in the hindwing cell. The hindwing black bands are thinner and lighter than in *p. polymnia* and the ground color has a slightly more red-brown hue and is paler.

Specimens examined, 230 ♂, 174 ♀:

PERU: **Cusco:** Quince Mil (Rio Inambari), 1 ♂ 1 ♀ (AMNH). **Madre de Dios:** Iberia (Rio Tahuamanu), Puerto Maldonado, 4 ♀ (AMNH).

BOLIVIA: **La Paz:** Sarampiuni, 1 ♂ (ZSB). **Cochabamba:** Chapare (Rio Chipiriri), Todos Santos, 8 ♂ 2 ♀ (JHM, ZSB). **Beni:** Rio Cavinas, Guayarameria, Reyes, Trinidad, Rio Yacuma, 24 ♂ 25 ♀ (BM, CM, RM, ZSB).

BRAZIL: **Amazonas:** Alliança (Rio Madeira), Bôca do Acre (Rio Purús), Humaytá (Rio Madeira), Manicoré (Rio Madeira), 54 ♂ 77 ♀ (BM). **Acre:** Senna Madureira (Rio Purús), 1 ♂ 1 ♀ (BM). **Guaporé:** Santo Antonio (Rio Madeira), Pôrto Velho (Rio Madeira), 4 ♂ 3 ♀ (BM). **Mato Grosso:** Rio Cuyabá, Chapada, Tombador, Villa María (Diamentino), Mato Grosso, 133 ♂ 55 ♀ (BM, CM). **Vague:** Brazil, 3 ♀ (CM).

NO DATA: 4 ♂ 3 ♀ (BM).

Mechanitis polymnia casabranca Haensch (Figs. 83, 88)

Mechanitis polymnia casabranca Haensch, 1905: 145-146; text fig. 3 (Monte Christo, Brazil). 1909: 124. Forbes, 1924: 146, 149, 154. Bryk, 1937: 496. Fox, 1940: 182. d'Almeida, 1951: 10.

The types are in Berlin Museum.

This is palest of the *polymnia* subspecies, with yellow in the hindwing discal cell and with a light brown ground color. To the west it grades into *angustifascia* and to the north into nominate *polymnia.*

Specimens examined, 50 ♂, 43 ♀:

BRAZIL: **Pará** (doubtful): Gurupí, 4 ♂ 1 ♀ (BM). **Maranhão** (doubtful): "Maranham", 2 ♂ (BM). **Goiás:** Goiás, 1 ♂ 5 ♀ (BM, ZSB). **Bahia:** Barreiras, 2 ♀ (CM). **Minas Gerais:** Bello Horizonte, Guaicuí, Rio Passa Quatro, Rio Jacinto (as "San Jacinthe valley"), São Lourenço, Sete Lagõas, "Sul de Minas," Minas Gerais, 24 ♂ 19 ♀ (AMNH, BM, CM, MCZ). **Espirito Santo:** Alto da Serra, 1 ♀ (BM). **Guanabara:** Nova Iguassú, Rio de Janeiro, Serra de Itatiaia, 3 ♂ 4 ♀ (CM, MCZ). **São Paulo:** Ashangahy (?), Guaratingueta, São Carlos, São Paulo, 6 ♂ 3 ♀ (BM, ZSB). **Paraná:** Castro, 1 ♂ 1 ♀ (BM). **Mato Grosso:** Mato Grosso (error ?), 1 ♂ (MCZ). **Not located:** Araras, Caraça, Pôrto Real, 1 ♂ 3 ♀ (BM). **Vague:** Amazons, Brazil, 3 ♂ 1 ♀ (BM, CM, MCZ).

ARGENTINA: Iguazú Parque National (as "Rio de Janeiro Nat. Park"), 1 ♂ 2 ♀ (BM).

ERROR: Cundinamarca (Colombia), 1 ♂ (BM).

NO DATA: 2 ♂ 1 ♀ (CAS, CM).

Mechanitis mazaeus

Three species have the lower discocellular spot larger than the upper: *mazaeus, egaensis* and *messenoides.* For this reason Forbes (1924, 1948) considered them as a single species, but only by separating them can the geographic confusion (Forbes, 1948: map 1) be resolved. *M. messenoides* is distinguished by having the base of the forewing all or mostly black and the distal edge of the postmedial fascia generally undulate rather than with acute projections. *M. egaensis* has the anal cross bar well marked and the apical patch is generally wider and more diffuse than in *M. mazaeus,* which usually lacks the anal cross bar or has it only as a faint line. Another difference setting off *mazaeus* is the extraordinary variability of all the subspecies; the subspecies of *messenoides* and *egaensis* vary within much narrower limits.

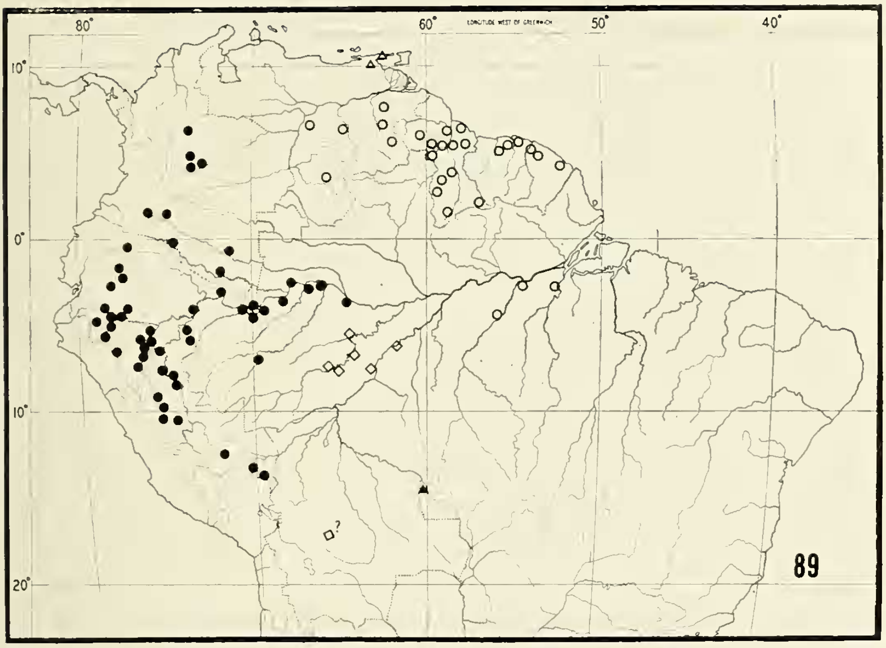


Fig. 89, South America showing the distribution of the subspecies of *M. mazaeus*: open triangles, *M. m. beebei* Forbes; open circles, *M. m. pannifera* Butler; solid circles, *M. m. mazaeus* Hewitson; open diamonds, *M. m. elevata* Riley; solid triangle, *M. m. pothetoides* d'Almeida.

There are five subspecies of *mazaeus* (fig. 89). *M. m. beebei* is thus far known only from the type series of 13 specimens from Monagas, Venezuela, and a female in British Museum (Natural History) from the Paria peninsula, Venezuela. *M. m. pannifera* is distributed from Bolívar, Venezuela, across the Guianas into Pará; the southernmost record is near the mouth of the Rio Xingu. *M. m. mazaeus* occurs from Cundimarca, Colombia, south through eastern Ecuador and Peru almost to Bolivia, on the Rio Jurúa and along the Amazon as far as Teffé where it intergrades with *M. m. elevata,* the subspecies inhabiting the lower and middle valleys of the Rio Purús and Rio Madeira. *M. m. pothetoides* is known only from a unique specimen from Mato Grosso.

Mechanitis mazaeus beebei Forbes (Figs. 89, 90)

[*Mechanitis mazaeus* "form", Forbes, 1940: 312.] 1942: 29. Lichy, 1943: 209.

Mechanitis mazaeus beebei Forbes, 1948: 13, 18-19; pl. 1, fig. 6 (Caripito, Monagas, Ven.). d'Almeida, 1951: 4.

The type series of 13 specimens is from Caripito, Monagas, Venezuela; the holotype and some of the paratypes are in Cornell University and the rest of the series is in the Museum of Natural History, Caracas. The best distinguishing character is the hindwing median band, which is well developed beyond Cu_2 but vestigial between Cu_2 and the anal margin. Like *pannifera,* the discocellular spots are separate, the discal cell spot is round and the cubital spot is small.

Specimen examined, 1 ♀:

VENEZUELA: **Sucre:** Patao (near Güiria), 1 ♀ (BM).

Mechanitis mazaeus pannifera Butler (Figs. 69E, 89, 91)

Mechanitis pannifera Butler, 1877: 150; pl. 3, fig. 8 (Obidos, Brazil). Kaye, 1907: 420, 430, 431-432, 435, 436; pl. 23, fig. 1, pl. 24, fig. 1. Haensch, 1909: 125: 33e. Fassl, 1915: 58. Forbes, 1924: 146, 150. Riley & Gabriel, 1925: 38. Bryk, 1937: 494. Forbes, 1940: 312. Fox, 1940: 182. Hall, 1939: 5. Forbes, 1948: 18, 20. d'Almeida, 1951: 4, 5, 8, 16.

=*Mechanitis visenda* Butler, 1877: 150 (Trovador, Rio Tapajós, Brazil. Haensch, 1909: 125. Riley, 1919: 182. Riley & Gabriel, 1925: 51. Bryk, 1937: 497. Fox, 1940: 182. Forbes, 1948: 12, 17, 20. d'Almeida, 1941: 3, 5, 8, 11, 16.

The holotype of *pannifera* is a male, number 7048 in the British Museum (Natural History), from "Obydos, Amazons". The holotype of *visenda* is a male from Trovador, Rio Tapajós, number 7054 in the same collection, and a paratype male from "Para" is numbered 7055.

The black pattern of the forewing is reduced, with the discocellular spots separated, the discal cell spot round and the cubital spot small; in contrast, the black pattern of the hindwing is well developed, with the marginal band distinctly rounding the apex to the costal margin. the median band wide and heavy and, especially in the Guianas, often fused with the marginal band. Butler named specimens with the fused hindwing markings *pannifera,* and farther down on the same page gave the name *visenda* to light specimens.

Specimens examined, 91 ♂, 84 ♀:

VENEZUELA: **Amazonas:** Mt. Duida, 1 ♂ 1 ♀ (AMNH). **Bolívar:** Rio

Clarito, Km. 82 on road El Dorado-Santa Elena, El Pao mine, La Pima (as "La Pinta"), Rio Suapure, La Unión (Rio Caura), 15 ♂ 1 ♀ (AMNH, BM, CM, JHM, MCZ). Vague: Venezuela, 2 ♂ 2 ♀ (AMNH, BM).

GUYANA: Annai, Bartica, Chenapowu, Cottica, Demerara River, Essequibo River, Kartabo, Kurupung River, Kutari River, Mabaruma (?), Malali, McKenzie, Narini (?), Omai River, Potaro River, Rockstone, Rupununi River, Shudikar-wau River, Tacutú River, British Guiana, 30 ♂ 36 ♀ (AMNH, BM, CM, RM).

SURINAM: Berg-en-Daal, Paramaribo, Saramacca River, Surinam, 4 ♂ 3 ♀ (BM, CM).

FRENCH GUIANA: Mana Riviére, St. Jean, St. Laurent, Saut Kreek (as "Pied Saut"), Cayenne, French Guiana, 12 ♂ 19 ♀ (AMNH, BM, CM, RM, ZSB).

BRAZIL: Pará: Itaituba, Mujo (Rio Tapajós), Santarém, Vitoria do Xingu, Pará, 16 ♂ 11 ♀ (BM, CM, MCZ, ZSB). Vague: Amazonas, Brazil, 2 ♂ 1 ♀ (BM, MCZ, ZSB).

ERRORS: Barro Colorado (Panama), Bogota (Colombia), Caracas (Venezuela), 4 ♂ 5 ♀ (AMNH, BM, RM).

NO DATA: 3 ♂ 4 ♀ (BM).

Mechanitis mazaeus mazaeus Hewitson (Figs. 89, 92, 93)

Mechanitis mazaeus Hewitson, 1860 [1852-1876], 2: [28]; pl. [14], fig. 8 (Amazon). Bates, 1862: 532. Kirby, 1871: 24. Staudinger, 1885 [1884-1888]: 62. Weymer, 1890: 81. 1899: 305. Haensch, 1903: 167. 1905: 146, 147. 1909: 123, 125; pl. 34a. Forbes, 1924: 146, 147, 148, 149-150, 154-155. Riley & Gabriel, 1925: 32. Forbes, 1927: 32. Bryk, 1937: 492. Fox, 1940: 182. Forbes, 1948: 17. d'Almeida, 1951: 3, 4, 8, 9, 16.

=*Mechanitis fallax* Butler, 1873: 154 (Bogota). Kirby, 1877: 694. Haensch, 1903: 166. 1909: 125. Forbes, 1924: 146, 150, 154. Riley & Gabriel, 1925: 19. Bryk, 1937: 493. Fox, 1940: 182. Forbes, 1948: 18. d'Almeida, 1951: 4, 8, 12, 13, 14, 16.

[*Mechanitis doryssides* ab. "plagifera" Staudinger, 1885 [1884-1888]: 62 (Jurimaguas, Peru).] Bryk, 1937: 494. d'Almeida, 1951: 8, 16.

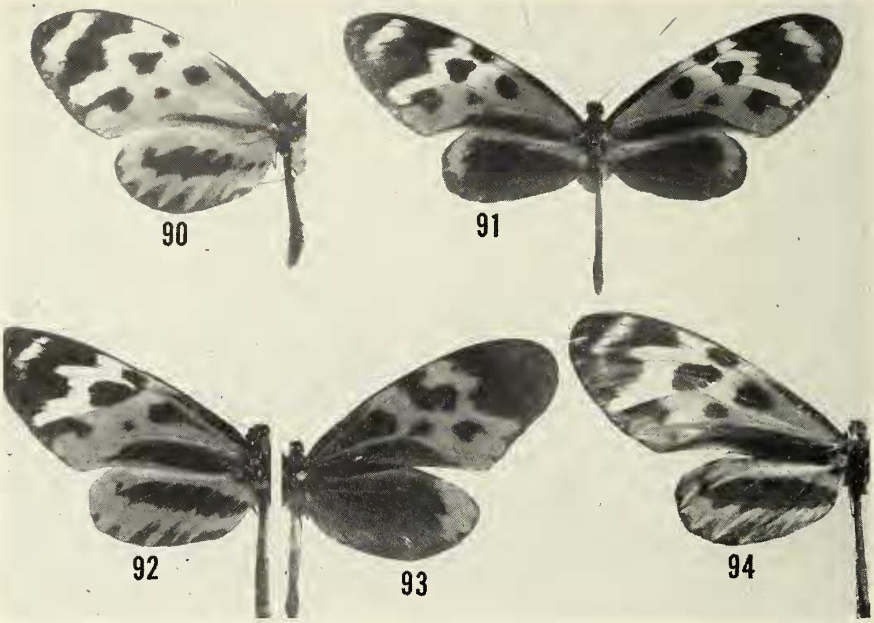
[*Mechanitis mazaeus* ab. "nigroapicalis" Haensch, 1905: 146 (São Paulo de Olivençia).]

=*Mechanitis messenoides nigroapicalis* Haensch, 1909: 125. Forbes, 1924: 146, 150. Bryk, 1937: 493. Fox, 1940: 182. Forbes, 1948: 16. d'Almeida, 1951: 3, 4, 8, 16.

=*Mechanitis egaensis septentrionalis* Apollinar, 1928: 180 (Garogoa, Boyaca, Colombia). Bryk, 1937: 484. Fox, 1940: 182. Forbes, 1948: 12.

=*Mechanitis mazaeus williamsi* Fox, 1941: 6-8; fig. 16 (Achinamiza, Peru). Forbes, 1948: 12, 17, 20. d'Almeida, 1951: 3, 5-6, 8, 16.

=*Mechanitis foxi* d'Almeida, 1951: 14-16, 17; pl. 1, figs. 1, 2 (Upper Rio Juruá, Brazil).



Figs. 90-94. Fig. 90, *M. m. beebei* Forbes, paratype ♀, Caripito, Monagas, Venezuela, CU; slightly reduced. Fig. 91, *M. m. pannifera* Butler, ♂, La Pima, Bolívar, Venezuela, CM. Fig. 92, *M. m. mazaeus* Hewitson, a light ♂ (*fallax* Butler), Rio Ortegazua, Caquetá, Colombia, CM. Fig. 93, *M. m. mazaeus* Hewitson, an extremely dark ♀, Achinamiza, Loreto, Peru, CM. Fig. 94, *M. m. elevata* Riley, holotype ♂, Alliança, Rio Purús, Brazil, BM. Figs. 91-94 natural size.

The holotype of *mazaeus* is a female from "Amazona", number 7053, and the holotype of *fallax* is a female from "Bogota", number 7056, both in British Museum (Natural History). The location of the type of *septentrionalis* is not known to me. The holotype of *williamsi*, a male from Achinamiza, Peru, is in the Reading Museum and paratypes are in Carnegie Museum, American Museum of Natural History, Cornell University and Instituto Oswaldo Cruz. The holotype male and allotype female of *foxi*, both from Upper Rio Jurúa, Brazil, are in Museum Nacional, Rio de Janeiro, respectively numbered 13,950 and 13,947. The type of *nigroapicalis* is probably in Berlin Museum. I have studied the types of "plagifera" from the Berlin Museum, two males from Jurimaguas, Peru. The name was proposed as an aberration and since no subsequent author has used it in any other sense, it does not exist officially.

As the list of synonyms suggests, this subspecies is unusually variable and the principal color deviations have been named. The commonest form, found throughout the range, has the forewing fascia and the subapical crescent both yellow (*visenda*). The subapical crescent, however, may be more or less orange-tawny and sometimes entirely so (*williamsi*). The postmedian fascia, in a relatively small percentage of specimens, is tawny, in which event the subapical crescent is also tawny (*mazaeus* as originally described) or absent, with the whole apex black (*nigroapicalis*). The black markings on the forewing are generally well developed, with the discocellular spots connected and the discal cell spot elongated, but associated with any of the possible combinations of yellow or tawny coloring, a few specimens have these black spots strongly reduced so that the little discocellular spots are well separated, the discal cell spot and the cubital spot small or even absent; this condition, along with complete replacement of yellow by concolorous tawny was named *foxi*.

None of these variants is geographically correlated or represents a population: all can be found among the material from almost any locality where there has been enough collecting. For example, the tawny postmedian fascia with reduction or absence of the subapical crescent is a feature more frequent toward the south, but such individuals also occur in the northern part of the distribution.

Specimens examined, 344 ♂, 267 ♀:

COLOMBIA: **Santander:** Quebrada Armas, 1 ♂ (AMNH). **Cundinamarca:** Choachí, Cundinamarca, Guayabetel, 3 ♂ 2 ♀ (AMNH, BM, RM). **Metá:** Buenavista, Cuchilla, Rio Guamal, Rio Guayuriba, Llanos de San Martín, Rio Ocoa, Cano Quenane, Villavicençio, 10 ♂ 15 ♀ (AMNH, BM, CAS, CM, ZSB). **Caquetá:** Rio Caquetá, Rio Ortegazua, 15 ♂ 2 ♀ (AMNH, BM, CM). **Putumayo:** Mocoa, 1 ♂ (ZSB). **Amazonas:** Caucayá, Isla la Ronda, Leticia, lower Rio Putumayo, Rio Tacaná, 47 ♂ 22 ♀ (AMNH, CM). **Vague:** Interior, Bogotá, Colombia, 22 ♂ 46 ♀ (AMNH, BM).

ECUADOR: **Oriente:** Aguano, Canelos, Chupientsa, Rio Cotapina, Curnari (?), Loja (east of), Macas, Rio Napo, Sarayacu, Sucua, Zumba, 15 ♂ 13 ♀ (AMNH, BM, CM, RM, MCZ). **Vague:** Oriente, Ecuador, 12 ♂ 3 ♀ (AMNH, BM, CM, MCZ, ZSB). **Error:** Cojimes (Manabi), 1 ♂ (CM).

BRAZIL: **Amazonas:** Benjamin Constant, Fonte Bôa, São Jõas, (Rio Solimões), Rio Jurúa, Jutahuy (Rio Solimões), Pupunha (Rio Jurúa), São Paulo de Olivençia, Tabatinga, Teffé (=Ega), Tonatins, 35 ♂ 25 ♀ (AMNH, BM, RM). **Vague:** Amazonas, Brazil, 11 ♂ 3 ♀ (BM, CM, MCZ). **Errors:** Manoas, Rio de Janeiro, 2 ♀ (BM, RM).

Peru: **Amazonas:** Rio Cenipa, Rio Charapa, Quebrada Huachinza, Rio Manchari, Rio Nievo, Rentema Falls, Rio Santiago, Rio Tabaconas, 24 ♂ 20 ♀ (AMNH, BM, CM). **Loreto:** Achinamiza, Rio Ampyam (?), Balsapuerto, Rio Blanco, Caballococha, Rio Cachiyacu (near Iquitos), Chimbireyacu (near Yurimaguas), Rio Cushabatay, Escalera-Yacu, Rio Huallaga, Iquitos, Maquea, Rio Marañon, Rio Pacaya, Pampa Hermosa, Pébas, Pucallpa, Puerto Melendez, Rio Tapiche, Rio Ucayali, Rio Utoquinia, "Yahuas Ty.", Lago Yarina-Cocha, Yurimaguas, 124 ♂ 82 ♀ (AMNH, BM, CM, MCZ, RM, ZSB). **San Martín:** Chasuta, Juanjui, Moyabamba, Pachisa, Rio Pisuquia, 5 ♂ 9 ♀ (AMNH, BM, RM). **Huánuco:** Pachitea, Pozuzo, Tingo Maria, 7 ♂ 6 ♀ (BM, CAS, MCZ). **Pasco:** Rio Chuchurras, 4 ♀ (BM). **Cusco:** Rio Chanchosmayo, Rio Chaquimayo, 2 ♂ 1 ♀ (BM). **Puno:** La Unión (Rio Huancamayo), 2 ♂ (BM). Vague: northeast Peru, 1 ♂ 1 ♀ (AMNH), Peru, 1 ♂ 1 ♀ (CM).

Not Located: Coputara, 1 ♂ (MCZ).

Errors: Guatemala, San Pedro (Honduras), San José (Costa Rica), 2 ♂ 6 ♀ (RM).

No Data: 3 ♂ 4 ♀ (AMNH, BM, CM, MCZ).

Mechanitis mazaeus elevata Riley (Figs. 89, 94)

Mechanitis visenda elevata Riley, 1919: 182 (Alliança, Rio Purús, Brazil). Riley & Gabriel, 1925: 18. Bryk, 1937: 497. Fox, 1940: 182. Forbes, 1948: 11, 16, 18, 20. d'Almeida, 1951: 4, 5, 8, 9, 17.

The holotype male and allotype female from Alliança, Rio Purús, are numbered 83 and 84 in British Museum (Natural History).

Both of these specimens have a rich mahogany-cinnamon ground color never found in any other *mazaeus* subspecies. However, somewhat more than half of the specimens seen have, instead, the ground color a yellow tawny and are quite close to the *fallax* variant of *mazaeus mazaeus.*

The material taken on the Rio Purús by Wickham and by Klages, along with specimens attributed to Teffé (but more probably from the Purús), are either mahogany-cinnamon (19 ♂, 10 ♀) or yellow-tawny (21 ♂, 9 ♀), and two of the latter males have the forewing postmedial fascia and the subapical crescent tawny. On the other hand, the good series from the Rio Madeira in the British Museum (43 ♂, 25 ♀) does not show the either-or situation but grades from one ground color to the other with all possible intermediate shades. Whatever the ground color, the subapical crescent is always present, it and the postmedial fascia are almost always yellow and the hindwing bands are separated.

Taken as a whole population, *elevata* is essentially distinguished by the kind and range of variation rather than by more traditional characters.

Specimens examined, 86 ♂, 48 ♀:

Brazil: Amazonas: Alliança (Rio Purús), Humaytá (Rio Madeira), Hyutanahã (Rio Purús), Rio Madeira, Nova Olinda (Rio Purús), Santa Maria dos Marmelos, Sebastopol (Rio Purús), 68 ♂ 29 ♀ (BM, CM). Vague: Brazil, Teffé, 17 ♂ 19 ♀ (BM, CM).

Error (?): Cochabamba (Bolivia), 1 ♀ (RM).

Mechanitis mazaeus pothetoides d'Almeida (Fig. 89)

Mechanitis fallax pothetoides d'Almeida, 1951: 13-14, 16; pl. 5, fig. 2 (Rio Verde, Mato Grosso, Brazil).

This was described from a single female taken on the Rio Verde, Mato Grosso, Brazil, number 14,017 in Museo Nacional, Rio de Janeiro, which has separated discocellular spots, rounded discal cell and cubital spots, short yellow subapical crescent and undulate (not angled) yellow postmedial fascia on the forewing, but differs in that the hindmarginal bar of the forewing is narrower and the bands of the hindwing are reduced to separated elements. This Mato Grosso *mazaeus* may really be the eastern extension of *elevata,* but I have seen no specimen and for the present prefer to recognize it as a valid subspecies.

Mechanitis egaensis

The second of the species with the lower of the discocellular spots larger than the upper and with the hindwing marginal series elongated and tending to fuse with the median band, *egaensis* differs from *mazaeus* in that the forewing subapical patch is ovid, not crescentate, with its boundary generally smudged rather than sharp, and the anal bar is stronger.

There are three subspecies (fig. 95), each of which flies with a subspecies of *mazaeus* and one of which also coinhabits an area with a subspecies of *messenoides*. *M. egaensis* is everywhere the rarest of the three related species. *M. e. phasianita* is found in eastern Ecuador and northern Peru; *M. e. egaensis* is recorded from stations along the Amazon from Tabatinga to Teffé (localities recorded above Tabitinga and below Teffé probably are erroneous), and *M. e. contracta* is thus far known only from the lower Rio Madeira.

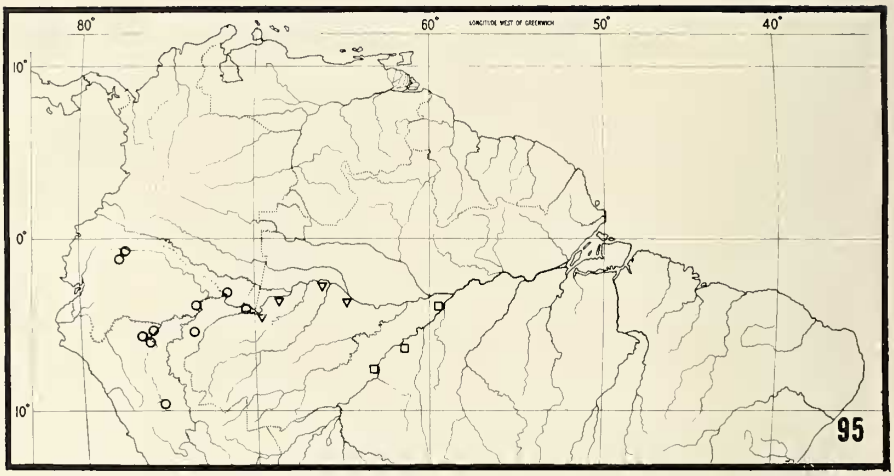


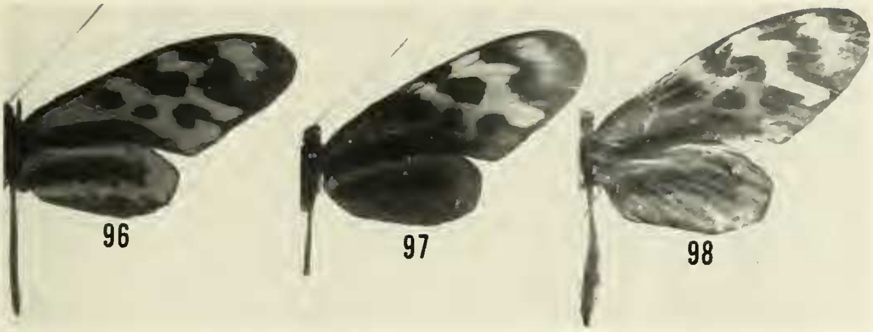
Fig. 95, South America, showing distribution of subspecies of *M. egaensis*: open circles, *M. e. phasianita* Haensch; open triangles, *M. e. egaensis* Bates; open squares, *M. e. contracta* Riley.

Mechanitis egaensis phasianita Haensch (Figs. 69F, 95, 96)

[*Mechanitis mazaeus* ab. "phasianita" Haensch, 1905: 146 (Jurimaguas, Peru)].
Mechanitis messenoides phasianita Haensch, 1909: 125 (Peru). Forbes, 1924: 146, 150. Bryk, 1937: 494. Fox, 1940: 182. Forbes, 1948: 16. d'Almeida, 1951: 3, 5, 8, 16.
[*Mechanitis mazaeus* ab. "lucifera" Haensch, 1905: 146-147; pl. 4, fig. 1 (Jurimaguas, Peru)].
=*Mechanitis messenoides lucifera* Haensch, 1909: 125 (Peru). Forbes, 1924: 146, 150. Bryk, 1937: 494. Fox, 1940: 182. Forbes, 1948: 16. d'Almeida, 1951: 3, 5, 8, 16.
=*Mechanitis egaensis obumbrata* d'Almeida, 1951: 10-11, 16; pl. 1, fig. 1 (Terr. Acre, upper Rio Juruá, Brazil).

The types of *phasianita* are a male and a female from Jurimaguas in the Berlin Museum. The types of *lucifera,* also in the Berlin Museum, are three males and three females. Note that both names originally were used as aberrations by Haensch in 1905, and therefore are not available from that date, but were apparently used as subspecies by Haensch in 1909. The types of *obumbrata* are two females, numbers 14048 and 14049 in the Museu Nacional do Bresil.

The coloring is, in most specimens, uniformly orange tawny and the resemblance to similarly colored *mazaeus* is remarkable, but the



Figs. 96-98. Fig. 96, *M. e. phasianita* Haensch, ♂, "Upper Amazon", CM. Fig. 97, *M. e. egaensis* Bates, ♂, Teffé, Amazonas, Brazil, CM. Fig. 98, *M. e. contracta* Riley, holotype ♂, Alliança, Rio Purús, Brazil, BM. Natural size.

differences previously mentioned will serve to separate them. One female seen has the subapical patch centrally yellow and one male has both the subapical patch and the postmedial fascia largely yellow. Many individuals have the black bands of the hindwing fused into a patch.

Specimens examined, 26 ♂, 28 ♀:

COLOMBIA: no locality (Rio Putumayo ?), 1 ♂ (AMNH).

ECUADOR: **Oriente:** Aguano, Rio Napo, 3 ♂ 4 ♀ (BM).

PERU: **Loreto:** Achinamiza, Rio Ampyam (?), Balsapuerto, Caballococha, Chambireyacu (near Yurimaguas), Iquitos, Rio Tapiche, Pébas, Rio Ucayall, "Yahuas Ty.", Yurimaguas, 18 ♂ 23 ♀ (AMNH, BM, CM, MCZ, RM). **Huánuco:** Pachitea, 1 ♂ (MCZ). **Vague:** Peru, 1 ♂ 1 ♀ (CM).

BRAZIL: **Amazonas:** Rio Jurúa, 1 ♂ (CM).

NO DATA: 1 ♂ (CM).

Mechanitis egaensis egaensis Bates (Figs. 95, 97)

Mechanitis egaensis Bates, 1862: 529, 530, 531, 532; pl. 56, fig. 7a (Ega). Kirby, 1871: 24. Moulton, 1909: 597; pl. 32, figs. 4, 5. Haensch, 1909: 125; pl. 34a. Riley, 1919: 182. Forbes, 1927: 31. Bryk, 1937: 484. Fox, 1940: 182. Forbes, 1948: 11, 17. d'Almeida, 1951: 3, 4, 8, 10, 16.

= *Mechanitis obscura* Butler, 1877: 149 (Ega) [for *M. egaensis* var. 1, Bates, 1862: 532]. Haensch, 1909: 125. Riley & Gabriel, 1925: 36. Bryk, 1937: 484. Fox, 1940: 182. Forbes, 1948: 11, 12. d'Almeida, 1951: 9.

The type of *egaensis* was not listed by Riley & Gabriel (1925).

During my visit to British Museum (Natural History) in the winter of 1964-1965, I found a male and female in the collection both bearing the label "Ega, Amazons. Bates? 58-6". In the Department of Entomology Accession Book, entry number 6 for 1858 (to which "58-6" on the labels refers) states that this pair was part of a lot purchased from the dealer Stevens. It is known that Stevens received and sold the original Bates collection made on the Amazons (Horn and Kahle, 1935-1937: 12); these two specimens were Bates', despite the query on the labels, as the female was the model for Bates' figure (1862: pl. 56, fig. 7a). This female is herewith designated as the lectotype and is numbered 18191 in British Museum (Natural History). There are also four males and two females in the Godman and Salvin collection labelled "Ega, U. Amazons, H. W. Bates" and three of these males and one of the females also bear little red labels marked "egaensis". No doubt these were part of the original Bates collection and should be regarded as paratypes.

The holotype male and allotype female of *obscura* are Bates specimens from Ega, Amazons, numbered 7048 and 7049 in British Museum (Natural History). As Forbes (1948) observed, Bates' *egaensis,* var. 1 (hence *obscura*) is a darker intrapopulational variant.

Specimens examined, 48 ♂, 24 ♀:

BRAZIL: **Amazonas:** Amazons (Hewitson col.), Fonte Bôa, São Paulo de Olivençia, Tabatinga, Teffé, 45 ♂ 23 ♀ (BM, CM, MCZ, RM, ZSB).

ERRORS: Obidos (Brazil), Iquitos (Peru), 3 ♂ (BM).

NO DATA: 1 ♀ (MCZ).

Mechanitis egaensis contracta Riley (Figs. 95, 98)

Mechanitis egaensis contracta Riley, 1919: 182 (Alliança, Rio Purús, Brazil) Riley & Gabriel, 1925: 13. Bryk, 1937: 484. Fox, 1940: 182. Forbes, 1948: 11, 16, 17. d'Almeida, 1951: 3, 9, 16.

The holotype male and allotype female are from Alliança, Rio Purús, and numbered 85 and 86 in British Museum (Natural History).

The ground color is only slightly lighter than that of *egaensis* and is somewhat less reddish. Most specimens of *contracta* have the end of the forewing discal cell and the middle of Cu_1-Cu_2 yellow.

Specimens examined, 10 ♂, 3 ♀:

BRAZIL: Amazonas: Alliança (Rio Purús), Humaytá (Rio Madeira), Rio Madeira, Manicoré, (Rio Madeira), 10 ♂ 3 ♀ (BM).

Mechanitis messenoides

The third of the species with the lower discocellular spot larger than the upper, *messenoides* has the outer edge of the postmedian fascia undulate rather than sharply angled as in the *mazaeus* and *egaensis* populations found in the same geographic areas, and further differs in that the anal bar of the forewing is never present. Pinned side by side in series, *mazaeus* and *messenoides* are quite obviously different but it is not easy to provide fool-proof key characters. In many *messenoides* specimens, the base of the forewing is entirely black because of the complete fusion of the elongated discal cell spot with the costal and hindmarginal bars — a condition never found in *mazaeus* — but a certain number of individuals have more or less tawny along the costal and cubital veins, separating the three black basal elements; it is possible only to say that the width of these tawny lines in *messenoides* is less than those in dark *mazaeus*. The hindwing of *messenoides* is almost always black, with a marginal patch of tawny about 2-3 mm. wide at the apex and extending down to M_2 or M_3, rarely farther, but there are exceptional individuals with more tawny at the margin or at the end of the discal cell and I have seen several with the median and marginal black series partly separated by tawny. The forewing of *messenoides* almost always has the apex entirely black — as in a few *mazaeus* — but several specimens seen have the subapical spot suggested by yellow or orange scaling. The comma mark is always slim and placed well between Cu_1 and Cu_2, the cubital spot is small or absent and the upper discocellular spot often is absent.

There are three subspecies (fig. 99): *m. messenoides* is found in Colombia and on the Rio Putumayo grades into *m. deceptus*, which occurs in eastern Ecuador, northern and central Peru; *m. ballucatus* comes from southeastern Peru and Bolivia.

Mechanitis messenoides messenoides C. & R. Felder (Figs. 69G, 99, 100)

Mechanitis menophilus Hewitson (part), 1855 [1852-1876], 1: [17]; pl. [9], fig. 2 (New Grenada), not fig. 3. Riley & Gabriel, 1925: 33 (part).
Mechanitis messenoides C. & R. Felder, 1865 [1864-1867]: 356. Kirby, 1871: 641. Weymer, 1890: 19, 26. Haensch, 1903: 186. 1909: 122,

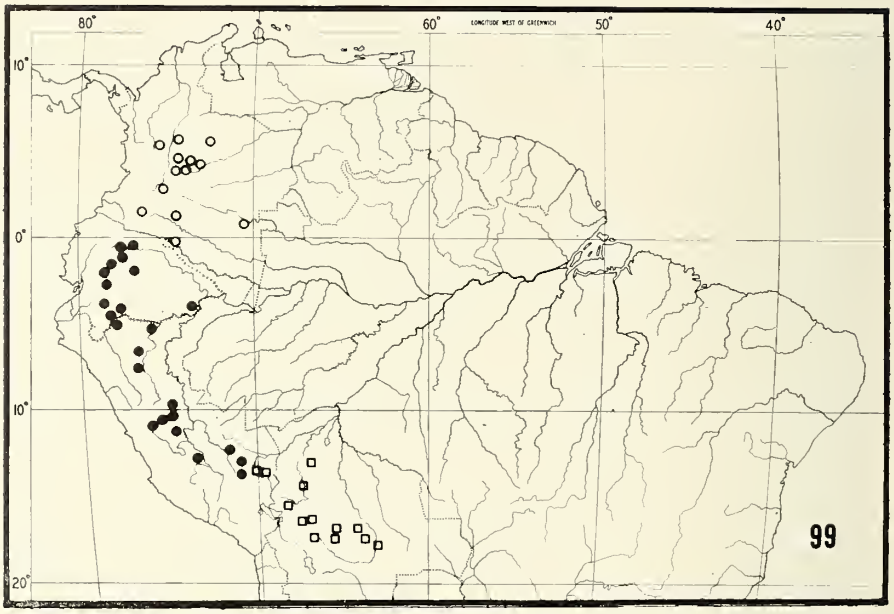


Fig. 99, South America, showing distribution of the subspecies of *M. messenoides*: open circles, *M. m. messenoides* C. & R. Felder; solid circles, *M. m. deceptus* Butler; open squares, *M. m. ballucatus* new subspecies.

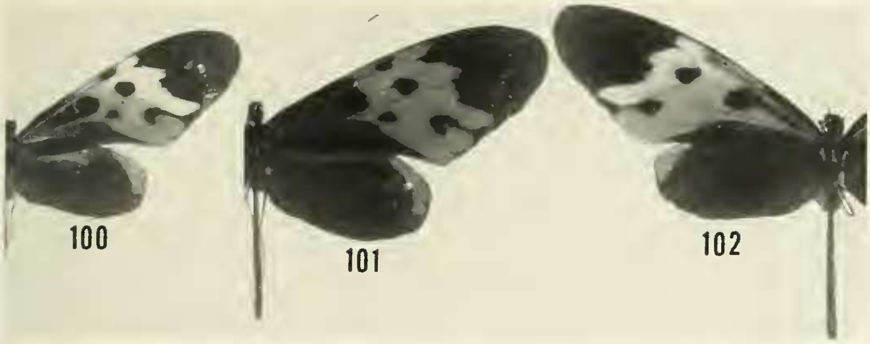
125; pl. 33f. Forbes, 1924: 146, 150. Bryk, 1937: 493. Fox, 1940: 182. Forbes, 1948: 17, 18. d'Almeida, 1951: 4, 6, 9, 17.

The Felders proposed *messenoides* for Hewitson's figure 2 of *menophilus*. Accordingly the original of this figure is the holotype and is number 7049, a female from "New Grenada", in British Museum (Natural History); this specimen was listed by Riley and Gabriel (1925) as a cotype of *menophilus*.

This subspecies is Colombian, occurring in the central and eastern valleys from Antioquia south to the Rio Putumayo, and is characterized by the bright yellow postmedian fascia of the forewing.

Specimens examined, 201 ♂, 230 ♀:

Colombia: **Antioquia:** Rio Corcorná, 5 ♂ 8 ♀ (AMNH, CM). **Cundinamarca:** Guayabetel, Quebrado Susumoco, Mt. Redondo, Cundinamarca, 15 ♂ 25 ♀ (AMNH, BM, CM, ZSB). **Tolima:** Cordón de Victoria, 1 ♀ (ZSB). **Boyacá:** Muzo, Támara, 4 ♂ 1 ♀ (CAS, ZSB). **Huila:** Neiva, 1 ♂ 3 ♀ (RM). **Metá:** Buenavista, Cuchilla (near Villavicençio), Rio Guamal, Rio Guayuriba, Llanos de San Martín, Manzanares, Quenane, Villavicençio, 44 ♂ 33 ♀ (AMNH, BM, CAS, CM). **Caquetá:** Rio Caquetá, Rio Orteguazua, 2 ♂ 2 ♀



Figs. 100-102. Fig. 100, *M. m. messenoides* C. & R. Felder, ♂, Buenavista, Metá, Colombia, CM. Fig. 101, *M. m. deceptus* Butler, ♂, Hacienda La Moscota, Rio Toro, Oriente, Ecuador, CM. Fig. 102, *M. m. ballucatus* new subspecies, holotype ♂, Rio Yapacani, Santa Cruz, Bolivia, CM. Natural size.

(AMNH, BM, CM). **Putumayo:** Mccoa, Puerto Limón, 5 ♂ 11 ♀ (AMNH, CM). **Amazonas:** Caucayá, 10 ♂ 5 ♀ (AMNH, CM). **Not located:** Corvairai, 1 ♂ (BM); Quebrada Tasajeras (Meta?), 13 ♂ 24 ♀ (AMNH, CM). **Vague:** Bogotá, Colombia, 81 ♂ 97 ♀ (AMNH, BM, CM, MCZ, ŻSB).

PERU: **Vague:** Northeastern Peru, 7 ♂ 7 ♀ (AMNH).

ERRORS: San Pedro (Honduras), San José (Costa Rica), Ega (Brazil), Rio Tapiche (Peru), 8 ♂ 7 ♀ (AMNH, RM).

NO DATA: 5 ♂ 6 ♀ (AMNH, BM, MCZ).

Mechanitis messenoides deceptus Butler (Figs. 99, 101)

Mechanitis deceptus Butler, 1873: 154 (Cuenca, Ecuador). Kirby, 1877: 694. Weymer, 1890: 52. Moulton, 1909: 599; pl. 33, fig. 4. Haensch, 1903: 167. 1909: 125. Riley & Gabriel, 1925: 15. Forbes, 1924: 146, 150, 154. Bryk, 1937: 492-493. Fox, 1940: 182. Forbes, 1948: 18. d'Almeida, 1951: 4, 6, 9, 17.

=*Mechanitis mazaeus simplex* Bryk, 1953: 29 (Roque, Peru). d'Almeida, 1956: 4 (as *simples*).

=*Mechanitis mazaeus holmgreni* Bryk, 1953: 29 (Chaquimayo, Peru). d'Almeida, 1956: 4.

The holotype of *deceptus* is a male from Cuenca, Ecuador, number 7050 in British Museum (Natural History); the two male paratypes, numbers 7051 and 7052, from Bolivia, pertain to the next subspecies.

I have examined the two Bryk types, both in the Stockholm Museum; *simplex*, described from a single female, has the black pattern of the forewing somewhat reduced, and in *holmgreni*, based on two specimens, it is strongly reduced. Both names apply to minor variations of the normal population. The locality label on the male type of *holmgreni* is probably incorrect.

This subspecies is characterized by the complete absence of yellow on the forewing, the postmedian fascia being the tawny ground color.

Specimens examined, 284 ♂, 286 ♀:

COLOMBIA: without locality (probably an error), 1 ♂ (CM).

ECUADOR: **Tungurahua:** Rio Margarjitas, Hacienda la Merced, Hacienda la Palmera, Hacienda San Francisco, Hacienda Santa Inés, Rio Topo, Yungilla, 14 ♂ 52 ♀ (AMNH, BM, CM, MCZ, RM, ZSB). **Azuay:** Cuenca, 1 ♂ (BM). **Loja:** Loja, 2 ♂ 1 ♀ (BM). **Oriente:** Abitagua, Aguano, Allpayacu, Ambato, Rio Anzu, Archidona, Baños, Rio Blanco, Canelos, Chupientas, Rio Coca, Rio Cotopina (?), Curarai, Gualaquiza, Huagra Yacu (?), Jatun Yacu, Macas, Mera, Hacienda la Moscota (?), Rio Napo, Rio Negro, Rio Pacayacu, Puyo, Rio Santiago, Sarayacu, Sucua, Rio Topo, Zamora, Zulay, Zumba, "Rio Toachi" (see Brown, 1941: 848), Oriente, 137 ♂ 143 ♀ (AMNH, BM, CM, RM, ZSB). **Vague:** Ecuador, 13 ♂ 11 ♀ (AMNH, BM, MCZ).

PERU: **Amazonas:** Rio Cenipa, Rio Nievo, Rio Santiago, 7 ♂ 6 ♀ (AMNH). **Loreto:** Achinamiza, Rio Cachiyacu (near Iquitos), 1 ♂ 2 ♀ (AMNH, BM). **San Martín:** Jepelacio, Moyabamba, Pachisa, 3 ♂ 1 ♀ (AMNH, BM, RM). **Huánuco:** Pozuzu, Tingo María, 14 ♂ 11 ♀ (AMNH, BM, CAS, ZSB). **Pasco:** Rio Chuchurras, Oxapampa, 2 ♂ 1 ♀ (BM, ZSB). **Junín:** Rio Colorado, Huancabamba, La Merced, Rio Perené, Satipo, 17 ♂ 12 ♀ (BM. CM). **Ayachucho:** Candalara la Mar, San Pedro, 10 ♂ 8 ♀ (CM). **Cusco:** Rio Chanchosmayo, Illipani, Marcapata, Rio Paucartambo, 39 ♂ 22 ♀ (BM, ZSB). **Puno:** Rio Chaquimayo, 3 ♂ 2 ♀ (BM). **Not located:** San Gaban, San Ramón (which?), Sani Beni, 8 ♂ 7 ♀ (BM, CM, RM). **Vague:** Peru, 7 ♂ 5 ♀ (AMNH, BM, MCZ, ZSB).

BRAZIL: **Amazonas:** Tonatins (error ?), 1 ♂ (BM); Ega (error ?) 1 ♂ 1 ♀ (RM).

ERROR: Paraguay, 1 ♂ (MCZ).

NO DATA: 2 ♂ 1 ♀ (AMNH, CM).

Mechanitis messenoides ballucatus new subspecies (Figs. 99, 102)

Mechanitis messenoides, Hayward, 1939: 378.

The *messonoides* population found in extreme southeastern Peru and in Bolivia is distinguished by variable golden yellow dusting on the essentially tawny postmedian fascia of the forewing. The postmedian fascia is never bright yellow as it is in Colombian *m. mes-*

senoides, and it is always partly tawny, or tawny scales are mixed with the yellow; at the other extreme, the fascia is entirely tawny on the upperside but has the golden hue on the underside. This coloring was noticed first by Hayward (1939).

On the hindwing, the tawny band at the apex does not pass below M_2 as it sometimes does in *m. deceptus.*

Holotype ♂. — Rio Yapacani, Bolivia; J. Steinbach, September 1914; in Carnegie Museum.

Paratypes: 86 ♂ 53 ♀:

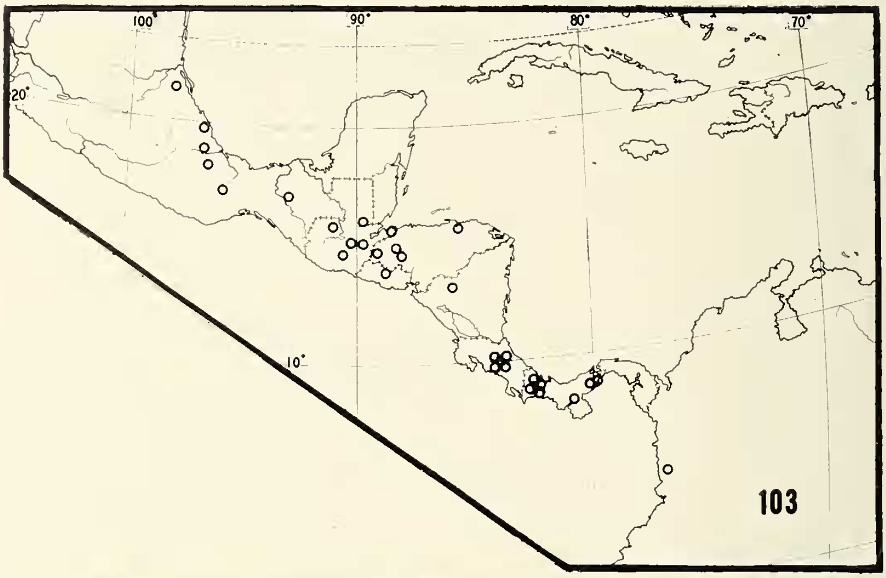
Peru: **Puno:** Rio Huacamayo, La Unión, Yahuaramayo, 29 ♂ 4 ♀ (BM).

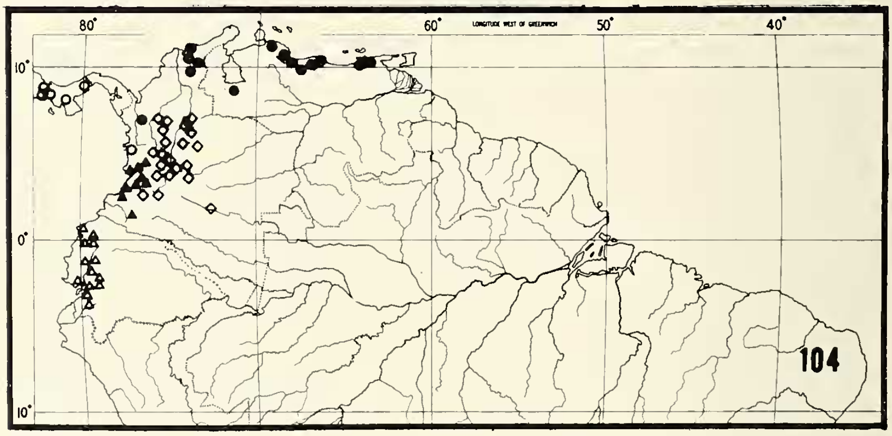
Bolivia: **La Paz:** Coroico, Guanay (Rio Mapiri), San Augustín, Sarampiuni, Yungas (Rio Zongo), 11 ♂ 12 ♀ (BM, MCZ, ZSB). **Beni:** Cavinas, Reyes, 2 ♂ 5 ♀ (BM, RM). **Cochabamba:** Charapaya, upper Rio Chipiriri, Rio Cristalmayo, Palmar, Todos Santos, San Jacinto, Yungas del Espirito Santo, 23 ♂ 18 ♀ (BM, CM, JHM, ZSB). **Santa Cruz:** Buena Vista, Sará, Rio Surutu, Rio Yapacani, Yungas de Palmar, 7 ♂ 7 ♀ (BM, CM, ZSB). **Not located:** Songatal, 3 ♂ 4 ♀ (ZSB). **Vague:** Bolivia, "5 days north of Cochabamba", 11 ♂ 3 ♀ (BM, MCZ).

Mechanitis menapis

There are five subspecies (Figs. 103, 104), including two noticed here for the first time. *M. menapis saturata* is found from Vera Cruz and Oaxaco, Mexico, south throughout Central America and on the Pacific drainage of Colombia into the state of Choco. *M. menapis caribensis* occupies the area along the northern coast of Colombia and Venezuela as far east as Trinidad. *M. menapis menapis* is the variable population occuring in central Colombia from Santander and Antioquia to the upper Rio Meta and into Tolimo. *M. menapis occasiva* flies in the Pacific valleys in the states of Valle de Cauca and Cauca. *M. menapis mantineus* is found in western Ecuador north into the state of Nariño, Colombia.

This species is characterized by the slightly elongated wings, accented as a rule by the development of the black pattern into longitudinal bands. On the hindwing, the median band is placed a little lower and nearer the margin than in other *Mechanitis.* On the forewing, the comma mark, not infrequently obscured, is thin with its tip expanded (fig. 69H), often connected to the strong anal bar to isolate a tawny spot in the anal angle and in four of the subspecies is also connected to the enlarged discocellular spots.





Figs. 103-104, distribution of subspecies of *M. menapis*. Fig. 103, Central America and northwestern part of South America: open circles, *M. m. saturata* Godman. Fig. 104, northwestern South America: open circles, *M. m. saturata* Godman; solid circles, *M. m. caribensis* new subspecies; open diamonds, *M. m. menapis* Hewitson; solid triangles, *M. m. occasiva* new subspecies; open triangles, *M. m. mantineus* Hewitson.

Mechanitis menapis saturata Godman (Figs. 103, 104, 105)

[*Mechanitis doryssus* var., Godman & Salvin, 1879 [1879-1901], 1: 21; pl. 4, fig. 2.]

Mechanitis saturata Godman, 1901 [Godman & Salvin, 1879-1901], 2: 642

(Cachi, Costa Rica). Haensch, 1909: 126. Forbes, 1924: 146, 152. Riley & Gabriel, 1925: 44. Bryk, 1937: 487. Fox, 1940: 182.

The type series in British Museum (Natural History) consists of five males and ten females, numbers 7062-7077, from Honduras, Costa Rica and Panama; the holotype is a female.

The significance of *saturata* has been quite misunderstood by all previous revisors except Godman who finally became convinced that it is separate from the other Central American *Mechanitis.* Both Haensch (1909) and Forbes (1924) treated it as a "form" or "variation" of *doryssus,* which it most decidedly is not. In general *doryssus* is lighter than *saturata* and gives the impression — partly because of differences in the pattern — of having somewhat rounder, proportionately shorter wings. In individual cases it is sometimes difficult to separate the two, but the fused discocellular spots on the forewing of *doryssus* are usually not connected to the comma mark, or only incompletely at most, while in *saturata* the discocellular spots and comma mark form a solid band; the yellow postmedian fascia of *saturata* is also quite narrow and thin, but in *doryssus* it is always wider, especially toward its anterior end; the ground tawny of *saturata* is darker and more reddish than in *doryssus,* which is a lighter yellowish-tawny; finally, the hindwing median band is placed much closer to the marginal series in *saturata.*

Specimens examined, 106 ♂, 134 ♀:

MEXICO: **Vera Cruz:** Amatitlán, Catemaco, Córdoba, Jalapa, Presidio, 4 ♂ 5 ♀ (AMNH, BM, CM, ZSB). **Oaxaco:** Comaltepec, 1 ♀ (CM). **Chiapas:** San Cristóbal, Chiapas, 1 ♂ 1 ♀ (JHM, RM). **Vague:** Mexico, 1 ♂ (ZSB).

GUATEMALA: Rio Chixoy, Dueñas, Griqua (?), Rio Motagua, Panimá, Panzos, Parula (?), San Cristóbal (which ?), San Filipe (which ?), Santa Amelia (Pochuta), Tamahú, Guatemala, Pacific Coast, 22 ♂ 14 ♀ (AMNH, BM, CM, JHM, MCZ).

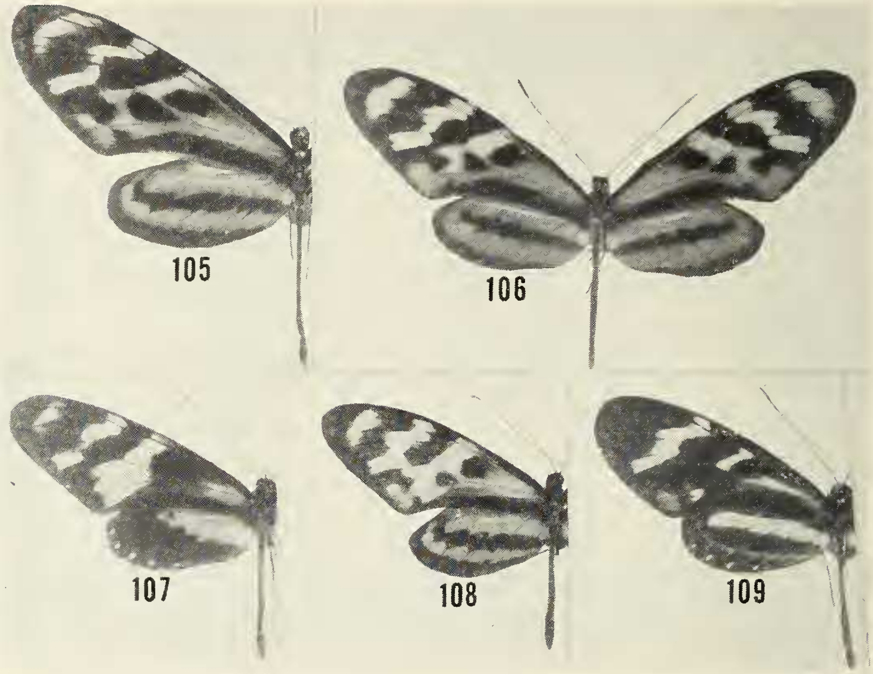
EL SALVADOR: Mt. Cerro Verde, 1 ♀ (CAS).

HONDURAS: Copan, Mirandilla (?), San Pedro Sula, Trujillo, Lago Yojoa, Honduras, 6 ♂ 6 ♀ (AMNH, BM, CM).

NICARAGUA: Jinotega, 1 ♂ 1 ♀ (BM).

COSTA RICA: El Alto, Aguagato mountains, Cachí, Cariblanco, Carillo, Cartago, Escasú, Volcan Irzaú, Juan Viñas, Moravia, San Francisco, San José, Turrialba, Costa Rica, 19 ♂ 28 ♀ (AMNH, BM, CM, HR, MCZ).

PANAMA: Bajo Boquete, Bugaba, Cerro Campana, Volcan Chiriquí, Co-



Figs. 105-109. Fig. 105, *M. m. saturata* Godman, ♂, Tamahú, Guatemala, CM. Fig. 106, *M. m. caribensis* new subspecies, holotype ♂, Puerto La Cruz, Dep't. Federal, Venezuela, CM. Fig. 107, *M. m. menapis* Hewitson, ♂, Quindío, Tolima, Colombia, CM. Fig. 108, *M. m. occasiva* new subspecies, paratype ♂, Munchique, Cauca, Colombia, CM. Fig. 109, *M. m. mantineus* Hewitson, ♂, Bucay, Guayas, Ecuador, CM.

lobre, David, La Laguna (Chiriquí), Lino, Potrerillos, Cerro Punta (Chiriquí), Panama, 37 ♂ 63 ♀ (BM, CM, HR, MCZ).

Colombia: **Choco:** Juntas de Tamaná, 2 ♂ 5 ♀ (BM).

Vague: Central America, 2 ♀ (MCZ).

Errors: Central Venezuela, 1 ♂ (BM); Bolivia, 1 ♀ (CM); Panamá, Brazil, 1 ♂ 1 ♀ (RM); East Ecuador, 1 ♀ (RM).

No Data: 11 ♂ 4 ♀ (BM, CM).

Mechanitis menapis caribensis new subspecies (Figs. 69H, 104, 106)

Along the northern coast of Colombia and Venezuela and on Trinidad there occurs a previously unrecognized subspecies of *menapis* which I have found confused in collections with *doryssus* from the same area. It differs from *M. m. saturata* in being smaller, more delicate and not quite so dark; the forewing postmedian fascia is wider than in *saturata* and is fully as wide as in *doryssus*, and the hindwing median band is thinner, so that a wider tawny band appears between it and the marginal band. *M. m. caribensis* differs from *doryssus* as follows: the yellow subapical patch on the forewing is generally smaller, the fused discocellular spots are broadly connected with the comma mark to form a continuous band, the tip of the comma mark is formed differently (figs. 69D and 69H) and the wings are a bit narrower; in *doryssus* the comma mark and the lower discocellular spot are sometimes connected by a thin line of black scaling along Cu_1, but usually are separated. The ground color of *caribensis* is darker and redder than the yellow tawny ground of *doryssus*, but it is not as dark a shade as in *saturata*. A great many specimens of *doryssus* from northern Colombia and northern Venezuela have the forewing yellow markings diluted or edged with tawny and a certain number of females have the hindmarginal bar of the forewing and the median band of the hindwing reduced or absent; neither condition is found in *caribensis*.

Holotype male and *allotype* female. — Puerto La Cruz, Dept. Federal, Venezuela; E. Holt, December 6 and 8 respectively, 1918; in Carnegie Museum.

Paratypes. — 82 ♂, 112 ♀:

Colombia: **Antioquia:** Frontino, 1 ♂ (BM). **Magdalena:** Bonda, 5 ♂ 4 ♀ (CM); Cincinnati, 1 ♀ (CM); Don Amo, 1 ♂ (CM); Rio Frío, 1 ♀ (BM); Rio Magdalena, 1 ♂ (CM); Manaure, 1 ♂ (BM); Onaca, 3 ♂ (CM), 1 ♀ (BM); Santa Marta Mts., 2 ♀ (BM); Ciénaga de Zapatoza (as "Lake Sapatoza"), 1 ♂ (BM). **Vague:** Bogotá, 1 ♂ (BM).

Venezuela: **Mérida:** Mérida, 7 ♂ 7 ♀ (BM). **Falcón:** Lagunita de Aroa, 1 ♂ 1 ♀ (CM); Pueblo Nuevo, 1 ♂ (CM). **Carabobo:** Carabelleda, Que Que, 3 ♂ 3 ♀ (JHM); Las Quiguas, 1 ♂ (BM) 2 ♀ (CM); Maracay, 9 ♂ 20 ♀ (ZSB); San Esteban, 11 ♂ 17 ♀ (BM), 1 ♂ (CM). **Dist. Federal:** Caracas, 1 ♂ 1 ♀ (AMNH), 2 ♂ 11 ♀ (BM), 3 ♂ 2 ♀ (ZSB); La Guarira, 3 ♂ 1 ♀ (BM); El Junquito, 2 ♀ (JHM); El Limón, 6 ♂ 2 ♀ (CM); Puerto la Cruz, 5 ♂ 3 ♀ (CM), 1 ♂ 1 ♀ (RM). **Aragua:** Las Delicias, 1 ♀ (JHM); Pie del Cerro, 3 ♂ 3 ♀ (CM). **Miranda:** Guatire, 2 ♀ (JHM); Petare, 3 ♀ (CM); Santa Lucía, 1 ♂ (CM). **Sucre:** Cumaná, 3 ♀ (BM); Cumanacoa, 7 ♀ (CM), 1 ♀ (RM); El Yaque, 1 ♀ (CM). **Not located:** El Pilar (which ?), 1 ♂ (BM). **Vague:** Venezuela, 2 ♂ 2 ♀ (BM), 4 ♂ 2 ♀ (CM), 1 ♂ (RM).

Trinidad: 2 ♂ (BM), 1 ♀ (CM).

Error: Chiriquí (Panama), 1 ♀ (BM).

No Data: 1 ♀ (BM), 1 ♀ (MCZ).

Mechanitis menapis menapis Hewitson (Figs. 104, 107)

Mechanitis menapis Hewitson, 1855 [1852-1876], 1: [17]; pl. [9], fig. 1 (New Grenada). Kirby, 1871: 24. Hopffer, 1879: 419. Weymer, 1890: 17, 26, 33, 35, 90. Haensch, 1909: 126; pl. 33f. Forbes, 1924: 147, 152, 157. Riley & Gabriel, 1925: 33. Bryk, 1937: 492. Fox, 1940: 182.

=*Mechanitis franis* Reakirt, 1868: 90 (New Grenada). Kirby, 1871: 24. Haensch, 1909: 126; pl. 33f. Forbes, 1924: 146, 147, 151, 156. Bryk, 1937: 492. Fox, 1940: 182.

=*Mechanitis menapis peruana* Hopffer, 1879: 419-420 (no locality cited). Haensch, 1909: 126. Bryk, 1937: 492. Forbes, 1948: 12.

The type of *menapis*, a female from "New Grenada", is number 7101 in the British Museum (Natural History). The type of *franis* is in the Field Museum, Chicago. The type of *peruana* went to the Berlin Museum with the Staudinger collection.

In the type of *menapis* the hindwing bands are fused, with only the discal area light; in *franis* the hindwing median and marginal bands are separate, leaving a narrow tawny band between them; *peruana*, which most certainly did not come from Peru, has the hindwing disc at least party yellow instead of tawny. All three of these variants occur everywhere within the range of the subspecies. The darkest specimens are more frequent in the south and central part of the range, while around the northern, eastern and western borders the lighter variants are more frequent.

The discocellular spots and comma mark of the forewing form a continuous band and, in all but the lightest specimens, the anal angle beyond the anal bar and the comma mark is entirely black. In those light specimens where the comma mark is distinct, it is seen to be formed exactly as in *saturata* and *caribensis*.

Specimens examined, 163 ♂ 291 ♀:

COLOMBIA: **Antioquia:** Rio Cocorná, Caldas, Valdivia, Antioquia, 24 ♂ 22 ♀ (AMNH, BM, CM, ZSB). **Santander:** Quebrada Armas, Bolívar, Carare, Costa Rica (?), Landázuri, Porvenir, 7 ♂ 12 ♀ (AMNH, BM, CM). **Boyaca:** Muzo, Rio Opón, Tunja, 17 ♂ 37 ♀ (AMNH, BM, RM, ZSB). **Caldas:** Manizales, Pueblo Rico, 6 ♂ 7 ♀ (AMNH, BM, CM). **Tolima:** Quindío, Viotá, Tolima, 7 ♂ 35 ♀ (AMNH, BM, CM, RM). **Cundinamarca:** mountains near Bogotá, Bogotá to Buenavista, Cananche (?), Choachí, Fusagusugá, Guaduas, La Mesa, Yacupí, Cundinamarca, 2 ♂ 19 ♀ (BM, CAS, CM, RM). **Huila:** Neiva, 5 ♂ (RM). **Metá:** Buenaventura, Llanos de San Martín, Quebrado Susumoco, Villavicençio, 4 ♂ 2 ♀ (AMNH, BM). **Vaupes:**

Esperanza, 2 ♂ (BM). **Cauca:** Popayán, 2 ♂ 1 ♀ (BM). **Vague:** Honda (which ?), 1 ♂ 6 ♀ (BM), Caucathal, 1 ♀ (BM), Magdalena valley, 9 ♂ 9 ♀ (BM), Bogotá, New Grenada, Colombia, 58 ♂ 102 ♀ (AMNH, BM, CM, MCZ, RM).

ERRORS: San Pedro (Honduras), 1 ♀ (RM); Panama, 1 ♀ (AMNH); Port of Spain (Trinidad), 1 ♂ (BM); Ecuador, 1 ♀ (MCZ); Peru, 1 ♀ (BM); northeast Peru, 7 ♂ 11 ♀ (AMNH); Chanchamayo (Peru), 1 ♂ 1 ♀ (RM); Sana (Peru), 1 ♀ (RM); La Marced (Peru), 1 ♂ (RM); Brazil, 1 ♀ (MCZ); Rio Grande do Sul (Brazil), 1 ♀ (RM).

NO DATA: 14 ♂ 14 ♀ (AMNH, BM, CM, MCZ).

Mechanitis menapis occasiva new subspecies (Figs. 104, 108)

On the Pacific slopes of Colombia in Valle de Cauca and Cauca there is a subspecies which most resembles *m. menapis* but in which the discocellular spots of the forewing are always well separated from the comma mark and sometimes (about 10%) are separated from each other, the anal angle has a tawny spot in most individuals, is rarely (about 5%) entirely black and generally is connected with the tawny area proximal because the anal bar and comma mark do not quite meet. On the hindwing the median band is usually separate, but sometimes (about 10%) it is fused with the marginal band. The yellow coloring is more extensive than in *m. menapis* and generally includes the end of the cell and the light part of Cu_1-Cu_2 and sometimes also the base on the forewing, and the hindwing discal cell is often bright yellow.

This subspecies is intermediate between *m. menapis* and *m. mantineus* but is readily separated from either.

Holotype male and *allotype* female. — Munchique, Cauca [State], Colombia; von Sneidern, August 1946; in American Museum of Natural History.

Paratypes. — 81 ♂ and 91 ♀:

COLOMBIA: **Caldas:** Pereira, 4 ♂ 7 ♀ (BM). **Valle del Cauca:** Caloto (?), 1 ♂ (BM); Cali, 2 ♂ 1 ♀ (AMNH), 1 ♀ (CZS), 4 ♂ 4 ♀ (BM); La Cascada (motor road to sea), 2 ♂ 1 ♀ (AMNH); Rio Dagua, 5 ♂ 7 ♀ (BM); Kilometer 22 (motor road to sea), 1 ♀ (AMNH); Pichinde, 13 ♂ 6 ♀ (AMNH), 4 ♂ 2 ♀ (CM); La Providencia (motor road to sea), 1 ♂ 2 ♀ (AMNH); Santa Rita, 16 ♂ 14 ♀ (BM); Savilla, 1 ♂ (CAS), "Tome" or "Torre" (illegible), 2 ♀ (BM). **Cauca:** Corinto (some as "Coreato"), 1 ♂ 4 ♀ (BM); Las Juntas, 3 ♂ 3 ♀ (BM); Munchique, 8 ♂ 8 ♀ (AMNH), 3 ♂ 3 ♀ (CM); Sachamates (?), 1 ♂ (AMNH). **Not located:** Valeta, 1 ♀

(RM). Vague: western Cordillera, 2 ♀ (BM); Caucathal, 1 ♀ (BM); Interior, 1 ♂ 2 ♀ (BM); Bogotá, 1 ♀ (CM); Colombia, 10 ♂ 16 ♀ (AMNH), 1 ♂ 1 ♀ (CM).

NO DATA: 1 ♀ (RM).

Mechanitis menapis mantineus Hewitson (Figs. 104, 109)

Mechanitis mantineus Hewitson, 1869 [1869-1877]: 12 (Ecuador). Kirby, 1871: 641. Hewitson, 1872 [1852-1876], 5: [10]; pl. [5], fig. 16. Kirby, 1877: 694. Haensch, 1903: 168. 1909: 126, pl. 34c. Forbes, 1924: 146, 147, 150, 156. Riley & Gabriel, 1925: 32. Campos, 1927: 7. Bryk, 1937: 491. Fox, 1940: 182.

The holotype is a male from "Ecuador", number 7100 in British Museum (Natural History).

This well-known and well-marked population has previously been regarded as a separate species, but it is clearly the culmination of the dark pattern of *menapis* and is quite nicely connected to it by *m. occasiva*. All tawny on both wings is replaced by yellow, except in the anal angle where a tawny spot is isolated by the joined anal bar and comma mark. The fused discocellular spots form a band with the comma mark and this in turn is joined to the widened hindmarginal bar by the enlarged cubital spot. On the hindwing, the median and marginal series are only narrowly separated and sometimes are nearly fused. The effect is striking, but the pattern is *menapis*.

Specimens examined, 78 ♂, 83 ♀:

COLOMBIA: **Nariño:** La Guayacaba, 2 ♀ (AMNH, CM).

ECUADOR: **Esmeraldas:** Rio Aguaclara, San Mateo, 1 ♂ 2 ♀ (CM, ZSB). **Manabi:** Rio Marcos, 1 ♂ 1 ♀ (CM). **Pichincha:** Santo Domingo de los Colorados, Rio Toachi, 4 ♂ 7 ♀ (AMNH, BM, RM). **Cotapaxi:** Angamarca, 3 ♂ 1 ♀ (BM). **Los Rios:** Rio la Chima, Montalvo, Quevedo, Santa Ana María, 3 ♂ 8 ♀ (AMNH, BM). **Bolívar:** Balzapamba, 22 ♂ 18 ♀ (AMNH, BM, RM, ZSB). **Guayas:** Bucay, Rio Daule, Guayaquil, 7 ♂ 6 ♀ (CM, JHM, RM, ZSB). **Chimborazo:** Chimbo, Dos Puentos, Huigra, Hacienda Jorge, Naranjapata, Chimborazo, 13 ♂ 17 ♀ (BM, CM). **Cañar:** Rio Angas (as "Angus"), 3 ♂ 1 ♀ (BM). **El Oro:** Morro, Zaruma, 9 ♂ 6 ♀ (AMNH, BM, RM). Vague: Limón (which ?), 1 ♀ (MCZ); Vicinity of Ambato (see Brown, 1941: 816), 4 ♂ 1 ♀ (BM); Ecuador, 8 ♂ 11 ♀ (BM, MCZ). **Error:** Zamora, 1 ♀ (BM).

Mechanitis lysimnia

The most easily recognized characteristic of this species is the proximal extension of the black coloring of the forewing apex, reach-

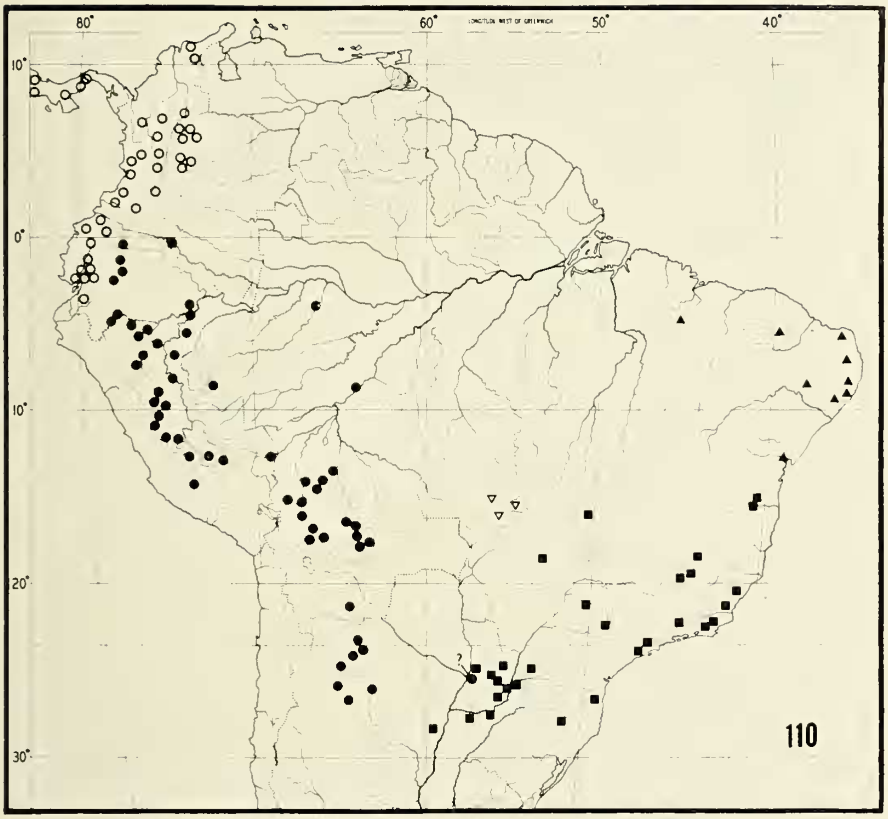


Fig. 110, South America, showing distribution of subspecies of *M. lysimnia*: open circles, *M. l. macrinus* Hewitson (5 ♂'s, 3 ♀'s with labels from Honduras, Nicaragua and Costa Rica may be errors and are not mapped); solid circles, *M. l. elisa* (Guerin-Méneville); open triangles, *M. l. connectens* Talbot; solid triangles, *M. l. nesaea* Hübner; solid squares, *M. l. lysimnia* (Fabricius).

ing to or just beyond the line of the discocellulars and nearly obliterating the postmedian fascia, which is represented, in most cases, only by little yellow spots in M_1-M_2, Cu_1-Cu_2 and sometimes also in some of the other spaces. A light-colored fascia is, however, formed by the yellow or white coloring in the end of the cell between the discocellular spots (encompassed in the black apical coloring) and the discal spot and continuing into the basal part of Cu_1-Cu_2.

There are five subspecies (Fig. 110), and considered together they are not as well-marked and strikingly different as has been thought by those who in the past have separated them as distinct species; rather, there is a surprising gradation on the periphery of the range of each subspecies into the adjacent subspecies. *M. l. macrinus* is found from Honduras and Nicaragua south through northern and central Colombia and along the Pacific coast into western Ecuador. *M. l. elisa* occurs along the Rio Putumayo in southern Colombia, in eastern Ecuador, in Peru and Bolivia and adjacent Brazil including Acre and the upper Rio Madeira, and in northern Argentina. Talbot's *connectens* from the Mato Grosso is intermediate between *elisa* and the populations in eastern Brazil with respect to pattern and coloring. *M. l. nesaea* is found in northeastern Brazil, from Pará to about the middle of Goyaz and the northern third of Minas Geraes. *M. l. lysimnia* occupies southeastern Brazil.

Mechanitis lysimnia macrinus Hewitson (Figs. 110, 111)

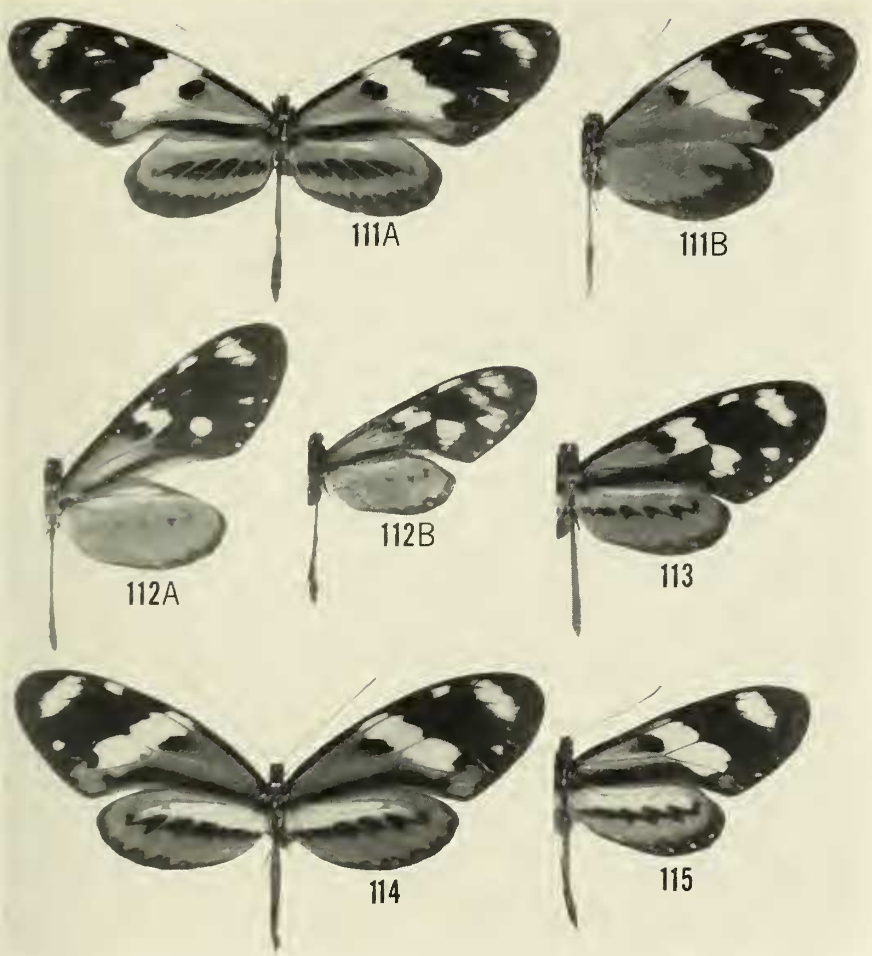
Mechanitis macrinus Hewitson, 1860 [1852-1876, 2]: [29]; pl. [15], fig. 11 (New Grenada). Kirby, 1871: 24. Butler & Druce, 1874: 334. Godman & Salvin, 1879 [1879-1901], 1: 22; pl. 1, figs. 5, 6. 1880: 121. Staudinger, 1884 [1884-1888]: pl. 28. 1885 [1884-1888]: 61. Dognin, 1891 [1887-1896]: 33. Haase, 1893: 53. Godman, 1901 [1879-1901]: 643. Haensch, 1903: 167. 1909: 127; pl. 34b. Dyar, 1914: 145. Forbes, 1924: 146, 148, 150, 155. Riley & Gabriel, 1925: 31. Huntington, 1932: 196. Bryk, 1937: 491. Fox, 1940: 182. Forbes, 1948: 13.

=*Mechanitis numerianus* C. & R. Felder, 1865 [1864-1867]: 368; pl. 45, fig. 9 (Bogotá). Kirby, 1871: 23. Haensch, 1909: 127. Bryk, 1937: 491.

=*Mechanitis macrinus blissi* Fox, 1942: 26-27; figs. 7, 8 (Ft. Kobbe, C. Z.). Forbes, 1948: 11.

[*Mechanitis doryssus saturata* ab. "escalantei" Hoffmann, 1940a: 636-637; fig. 2 (Acahuitzotla, Guerrero, Mex.).] 1940b: 664. Forbes, 1948: 11.

The holotype of *macrinus* is a male from "New Grenada", number 7027 in British Museum (Natural History). The holotype of *numerianus*, an absolute synonym, is a female from "Bogota", number 18171, and along with four female paratypes from "Nova Grenada", numbers 18172-18175, are in British Museum (Natural History) via the Rothschild collection. The holotype of *blissi*, also an absolute synonym, is a male from Ft. Kobbe, Panama Canal Zone, number 113 in the Reading Public Museum. Hoffmann described "escalantei" as a quadrinomial aberration, and on either ground the



Figs. 111-115. Fig. 111, *M. l. macrinus* Hewitson: fig. 111A, ♂, Hacienda Cutuguhy, Chimborazo, Ecuador, CM: fig. 111B, ♀, Viota, Tolima, Colombia, CM. Fig. 112, *M. l. elisa* (Guerin-Méneville); fig. 112A, dark ♂, Lago Yarina-Cocha, Loreto, Peru, CM: fig. 112B, light ♂, Satipo, Junín, Peru, CM. Fig. 113, *M. l. connectens* Talbot, paratype ♂, Tombador, Mato Grosso, Brazil, CM (*ex* BM). Fig. 114, *M. l. nesaea* Hübner, ♂, Pernambuco, Brazil, CM. Fig. 115, *M. l. lysimnia* (Fabricius), ♂, Bauru, São Paulo, Brazil, CM.

name is invalid; the types are in American Museum of Natural History via the Hoffman collection.

The males have a well developed median band on the hindwing, but the females have the median band absent or reduced to some black spots near the apex. The yellow band across the end of the cell and in Cu_1-Cu_2 is always continuous and in more than half of the individuals the cubital spot is missing — by these features *macrinus* can always be separated from *elisa,* even the lightest and most *macrininus*-like specimens, for in *elisa* the yellow in Cu_1-Cu_2 is always separated from the yellow in the end of the discal cell by the large, sometimes linear cubital spot.

The distribution of *macrinus* (Fig. 110) is very interesting, as it is continuous from western Ecuador to the southern half of Central America and includes only the northern and central regions of Colombia in addition to Pacific Colombia.

Specimens examined, 280 ♂, 200 ♀:

Honduras: no station, 1 ♂ (MCZ).

Nicaragua: no station, 1 ♀ (AMNH).

Costa Rica: Esperanza, no station, 4 ♂ 2 ♀ (BM, CM).

Panama: Albrook Field (Canal Zone), Barro Colorado Island, Bugaba, Calobre, Cerro Campana, Volcan Chiriquí, Cocali, Gatún, Ft. Kobbe, Lion Hill, Matachin (?), Canal Zone, Panama, 41 ♂ 20 ♀ (AMNH, BM, CAS, CM, HR, MCZ).

Central America: 1 ♂ 4 ♀ (CM).

Colombia: **Magdalena:** Manaure, Onaca, 2 ♂ (BM, CM). **Antioquia:** Rio Cocorná, Frontino, Valdevia, Antioquia, 3 ♂ 3 ♀ (AMNH, BM). **Santander:** Rio Armas, Boroscosa (?), Cazabe, Landazuri, Puerto Berrio, Sinistara (?), Rio Suárez, 23 ♂ 19 ♀ (AMNH, BM, CAS, CM, JHM). **Caldas:** Pueblo Rica, 15 ♂ 1 ♀ (AMNH, CM). **Cundinamarca:** mountains near Bogotá, Cananche (?), Rio Magdalena at Bogotá, Quebrado Susumoco, 11 ♂ 8 ♀ (BM, CM). **Boyaca:** Muzo, Rio Opon, Tunja, 21 ♂ 19 ♀ (AMNH, BM, CM, RM). **Tolima:** Rio Chilí, Quindío, Viotá, 3 ♂ 4 ♀ (BM, CM). **Huila:** Neiva, 1 ♀ (RM). **Metá:** Llanos de San Martín, Manzanares. Villavicençio, 1 ♂ 2 ♀ (AMNH, BM, CAS). **Valle de Cauca:** Rio Dagua, Sachamates (?), Tambito, 8 ♂ 4 ♀ (AMNH, BM). **Cauca:** Rio Guisito, Juntas, 1 ♂ 1 ♀ (AMNH, BM). **Nariño:** La Guayacana (?), 3 ♀ (AMNH). **Amazonas:** Caucayá (probably an error), 1 ♀ (AMNH). **Not located:** Frijoles, 1 ♂ (AMNH). **Vague:** Colombia, New Grenada, Bogotá, 42 ♂ 58 ♀ (AMNH, BM, CM, MCZ, RM, ZSB).

Ecuador: **Esmeraldas:** Rio Cachabi, Esmeraldas, 13 ♂ 1 ♀ (BM). **Manabi:** Palmar, 16 ♂ 2 ♀ (AMNH, BM, FMB, RM, ZSB). **Imabura:** Paramba, 3 ♂ 9 ♀ (BM). **Pichincha:** Santo Domingo de los Colorados, 9 ♂ 1 ♀ (AMNH, BM, RM). **Los Rios:** La Chima, Montalvo, Quevedo, Santa Ana María (near Quevedo), 15 ♂ 6 ♀ (AMNH, BM, FMB, RM). **Bolívar:** Balzapamba, 4 ♂ 4 ♀ (AMNH, FMB, RM). **Guayas:** Barraganatal, Bucay, Rio Daule, Guayaquil, 6 ♂ 4 ♀ (BM, JHM, MCZ, RM, ZSB). **Chimborazo:** Chimbo, Hacienda Cutuguay, Dos Puentos, Huigra, 16 ♂ 5 ♀ (BM, CM). **El Oro:** Zaruma, 1 ♀ (BM). **Vague:** Ecuador, 4 ♂ 3 ♀ (BM, MCZ).

Errors: Aguano and Zamora (Oriente), 5 ♂ 3 ♀ (BM); Jeveros (Peru), 1 ♂ 2 ♀ (RM); Surinam, Peru, Brazil, 3 ♂ (BM); northeastern Peru, 5 ♂ 3 ♀ (AMNH).

No Data: 2 ♂ 5 ♀ (AMNH, BM, CM, MCZ).

Mechanitis lysimnia elisa (Guérin-Méneville) (Figs. 110, 112)

Heliconia elisa Guérin-Méneville, 1844 [1829-1844]: 472 (Bolivia). Doubleday, 1847 [1846-1852]: 104.

Mechanitis elisa, Kirby, 1871: 641. Burmeister, 1879a: 121-122. Hopffer, 1879: 419. Weymer, 1890: 77-78. Berg, 1897: 239. Haensch, 1903: 166. 1909: 126. Köhler, 1923: 20. Forbes, 1924: 147, 153, 157. Köhler, 1929: 307; pl. 5, fig. 28, 29. Bryk, 1937: 484-485. Hayward, 1939: 378. Fox, 1940: 182.

=*Mechanitis menecles* Hewitson, 1860 [1852-1876, 2]: [30]; pl. [15], fig. 13 (Amazon). Felder & Felder, 1862a: 77. Kirby, 1871: 24. Haensch, 1909: 126. Forbes, 1924: 146, 152, 156. Bryk, 1937: 485. Fox, 1940: 182.

=*Mechanitis ocona* Druce, 1876: 203 (Santana, Peru). Kirby, 1877: 694. Haensch, 1903: 168. 1909: 126; pl. 34b. Forbes, 1924: 146, 152, 156. Prüffer, 1922b: 10. Kremky, 1925: 205-206; text fig. 69, 70; pl. 22, fig. 4. Bryk, 1937: 485. Fox, 1940: 182.

=*Mechanitis vilcanota* Röber, 1904: 105 (Cuzco, Peru). Bryk, 1937: 485.

=*Mechanitis elisa acreana* d'Almeida, 1950: 394; figs. 2, 3 (Xapuri, Rio Jurúa, Brazil). d'Almeida, 1956: 4.

=*Mechanitis elisa roqueensis* Bryk, 1953: 30 (Roque, Peru). d'Almeida, 1956: 4.

A female marked "Bolivia, 1834" in the Paris Museum is apparently the only surviving d'Orbigny specimen of those before Guérin-Méneville when he described *Heliconia elisa,* and this specimen is hereby designated as the lectotype. The type of *menecles,* an absolute synonym, is a female from "Upper Amazon", number 7099 in British Museum (Natural History). The type of *ocona* should be in the British Museum (Natural History); the name was applied to an *elisa* variant having especially well developed yellow spots in the postmedian area of the forewing, a variant which occurs with some frequency in Peru. The type of *vilcanota,* another synonym, is in the Berlin Museum. The holotype male of *acreana* is in d'Almeida's collection, along with four female paratypes; the allotype female is in the Museu Nacional, Rio de Janeiro, and there are ten paratypes in the collection of Oiticica Filho; the name was applied to rather dark individuals from the Rio Jurúa. The type of *roqueensis* is in the Stockholm Museum; the name is an absolute synonym.

The yellow cross band of the forewing is separated into two spots, one in the end of the cell and one in Cu_1-Cu_2, by which feature *elisa* may be separated from all other *lysimnia* except the darkest specimens of *connectens*. On the whole, the subspecies is remarkably stable and varies but little, though light individuals (*ocona*) or dark individuals (*acraeana*) occur exceptionally at most localities, and d'Almeida (private communication) informs me that in Acre, the specimens are prevailingly dark.

Specimens examined, 284 ♂, 272 ♀:

Colombia: **Amazonas:** Cacauyá, 1 ♂ 1 ♀ (AMNH).

Ecuador: **Oriente:** Aguano, Rio Arojuno, Berna, Canelos, Rio Coca, Rio Cotapino (?), Fortalaza (?), Macas, Rio Napo, Pacaiyacu (Rio Bobonaza), Sarayacu, Oriente, Ecuador, 25 ♂ 23 ♀ (AMNH, BM, CM, MCZ, RM, ZSB). **Error:** Rio Toachi (Pichincha), 1 ♀ (RM).

Peru: **Amazonas:** Rio Cenipa, Quebrada Huachinza, Puerto Melendez, Rio Santiago, 9 ♂ 10 ♀ (AMNH). **Loreto:** Rio Abujao, Achinamiza, Balsopuerto, Rio Cachiyacu (near Iquitos), Chambireyacu (near Yurimaguas), Rio Cushabatay, Iquitos, Nauta, Rio Pacaya, Rio Tapiche, Rio Ucayali, Lago Yarina-Cocha, Yurimaguas, 30 ♂ 23 ♀ (AMNH, BM, CM, RM). **San Martín:** Chasuta, Juanjui, Pachisa, Tarapoto, 10 ♂ 4 ♀ (AMNH, BM, MCZ, RM). **Huánuco:** Pachitea, Palcazu, Quebrada las Palmas, Pozzuzo, Quebrada Pumayacu, Tingo Maria, 6 ♂ 7 ♀ (AMNH, BM, CAS, ZSB). **Pasco:** Hacienda Mosela (Rio Oxapampa), 1 ♀ (ZSB). **Junín:** La Merced, Satipo, 6 ♂ 7 ♀ (BM, CM). **Ayachucho:** Candalara la Mar (?), San Pedro, 3 ♀ (CM). **Cusco:** Rio Chanchosmayo, Quillabamba, Cusco, 8 ♂ 9 ♀ (AMNH, BM). **Madre de Dios:** Puerto Maldonado, 1 ♂ 1 ♀ (AMNH). **Not located:** San Ramon (which ?), 2 ♀ (BM). **Vague:** Peru, northeastern Peru, 4 ♂ 5 ♀ (AMNH, BM, CM, ZSB).

Brazil: **Amazonas:** lower Rio Jurúa, Amazonas, 2 ♂ 1 ♀ (AMNH, ZSB). **Acre:** upper Rio Jurúa, 1 ♂ 1 ♀ (BM). **Guaporé:** San Antonio (Rio Madeira), 1 ♂ 3 ♀ (BM). **Errors:** Pará, 1 ♂ (BM); Jatahy, Goyaz, 1 ♀ (BM); Rio Negro (Felder coll.), 1 ♀ (BM).

Bolivia: **La Paz:** Rio Chaira, Chulumani, Coroico, Rio Puni (near Chulumani), San Carlos (Rio Mapiri), Yungas (near Chulumani), 32 ♂ 13 ♀ (BM, CAS, CM, MCZ, ZSB). **Beni:** Espíritu, Rio Mamoré, Reyes (some as "Bueyes"), Santa Rosa (Rio Yacuma), 10 ♂ 19 ♀ (BM, CM, ZSB). **Cochabamba:** Buenavista, Rio Chapare, Cocapata, Cochabamba, Todos Santos, Yungas de Arepucho, 13 ♂ 4 ♀ (BM, JHM, RM, ZSB). **Santa Cruz:** Buenavista, Limbi (?), Minas Mayo, Portachuelo, Sará district, Rio Surutú, Rio Yapacani, Santa Cruz, 80 ♂ 86 ♀ (BM, CM, ZSB). **Tarija:** Villa Montes, 5 ♂ 3 ♀ (ZSB). **Not located:** Cusilluni, Trinidad (which ?), 1 ♂ 3 ♀ (BM, MCZ, ZSB). **Vague:** Bolivia, 4 ♂ 5 ♀ (AMNH, BM, CM, MCZ, RM).

Paraguay: Trinidad (error ?), 1 ♀ (ZSB).

ARGENTINA: Jujuy: Esperanza, 30 miles south of Jujuy, San Pedro, Yuto, 12 ♂ 5 ♀ (CAS, ZSB). Salta: Rio Bermejo, Calimonte, Orán (Rio Bermejo), Salta, 5 ♂ 6 ♀ (BM, CM, ZSB). Tucumán: Sierra de Aconquija, Laguna de Malvinas, Tucumán, 12 ♂ 19 ♀ (BM, RM, ZSB). Not located: La Joija, 1 ♂ 2 ♀ (BM).

NO DATA: 3 ♂ 2 ♀ (BM, CM, MCZ).

Mechanitis lysimnia connectens Talbot (Figs. 110, 113)

Mechanitis elisa connectens Talbot, 1928: 412; pl. 14, fig. 8 (Rio Serregem, Mato Grosso, Brazil). Collenette, 1928: 393, 394, 399. Gabriel, 1932: 12. Bryk, 1937: 485. Fox, 1940: 182. Forbes, 1948: 11.

The holotype and allotype are in British Museum (Natural History) numbered 18431 and 18432, along with a large series of paratypes; three male and three female paratypes have been received by Carnegie Museum as part of an exchange.

As the name suggests, *connectens* links *elisa* with *nesaea* and *lysimnia*; dark individuals are quite similar to *elisa* and light individuals are very close to *nesaea*. The discal cell spot of the forewing of *connectens* is round and isolated, as in *nesaea*, while in *elisa* this spot is connected to the black streak along the costa and is usually elongated and streaked; the disc of the hindwing is tawny, as in *elisa*, and not yellow as in *nesaea*.

Specimens examined, 97 ♂, 50 ♀:

BRAZIL: Mato Grosso: Corrego, Chapada, Cuyabá-Corumbá river system, Tombador (south of Diamantino), Villa Maria, 96 ♂ 50 ♀ (BM, CM. MCZ).

ERROR: San Pedro Sula (Honduras), 1 ♂ (CM).

Mechanitis lysimnia nesaea Hübner (Figs. 691, 110, 114)

Mechanitis nesaea Hübner, 1820 [1806-1838], 2: pl. [2] (No locality cited). Felder, 1862: 475. Kirby, 1871: 24. Möschler, 1876: 310. Semper, 1886: 17, note. Kirby, 1908 [1894-1912]: 10. Moulton, 1909: 591. Haensch, 1905: 148 (as *nessaea*). 1909: 127; pl. 34b (as *nessaea*). Forbes, 1924: 147, 152 (as *nessaea*). May, 1924: 165-166 (as *nessaea*). Kremky, 1924: 178 (as *nessaea*). Hancock, 1926: 135-137 (as *nessaea*). Seitz, 1927: 48 (as *nessaea*). Williams, 1930: 241 (as *nessaea*). Bryk, 1937: 490-491, 494 (as *nessaea*). Fox, 1940: 182 (as *nessaea*). Forbes, 1948: 16, 21. d'Almeida, 1951: 8, 9-10, 17.

[*Mechanitis lysimnia* ab. "sulphurescens" Haensch, 1905: 148.]

=*Mechanitis nessaea sulphurescens* Haensch, 1909: 127 (Bahia, Brazil).

Forbes, 1924: 147, 152. May, 1924: 166 (as *sulphurea*). Hancock, 1926: 136. Seitz, 1927: 18. Köhler, 1929: 317-318. Ribeiro, 1931: 43. Bryk, 1937: 491. Fox, 1940: 182. d'Almeida, 1951: 10, 17.

According to Horn and Kahle (1935) the Hübner types are in the Vienna Natural History Museum. The type of *sulphurescens* is in the Berlin Museum; used originally as an aberration by Haensch (1905), the name takes validity from 1909, but is an absolute synonym.

d'Almeida (1951) regarded *nesaea* and *lysimnia* as being separate species because "both forms are found flying together in the northeastern region of Brazil as far as Espirito Santo." The region where the form with yellow apex and that with white apex fly together appears to be rather narrow, according to data at hand, and is the common boundary between the subspecies, about 11° or 12° N. lat., where an overlap is to be expected. It must be emphasized, too, that the true difference between these two subspecies is not really the color of the forewing apex: some *nesaea* have the apex white, some *lysimnia* have the apex yellow. Although most *nesaea* have the apex yellow, the best character for recognizing the northeastern Brazil subspecies is the fact that the tip of the comma mark and the tip of the anal bar do not quite meet, thus the tawny spot in the anal angle is not completely isolated, whereas in *lysimnia* these two black marks meet and the tawny spot in the anal angle is entirely surrounded by black. Furthermore, almost all *nesaea* have the postmedian fascia represented by two tiny spots, one at the costa and one in Cu_1-Cu_2, while almost all *lysimnia* lack these spots but have the submarginal dots present on the forewing, at least toward the anal angle, this series never being present in *nesaea*.

Specimens examined, 57 ♂, 81 ♀:

BRAZIL: **Pará:** Pará, 7 ♂ 6 ♀ (BM). **Maranhão:** Mt. Aureos, 2 ♂ (BM). **Ceará:** Ceará, 2 ♂ 2 ♀ (BM). **Rio Grande do Norte:** Natal, 1 ♂ 4 ♀ (ZSB). **Paraíba:** Paraíba, 1 ♂ 4 ♀ (AMNH). **Pernambuco:** Olinda, Pernambuco, 22 ♂ 31 ♀ (BM, CM, MCZ, ZSB). **Alagoas:** Munguba, Pessoa, 6 ♂ 6 ♀ (AMNH, JHM, MCZ). **Bahia:** Itaparica, Bahia, 13 ♂ 18 ♀ (AMNH, BM). **Minas Geraes:** Minas Geraes, 1 ♀ (ZSB). **Vague:** Brazil, 6 ♀ (MCZ).

NO DATA: 3 ♂ 3 ♀ (BM).

Mechanitis lysimnia lysimnia (Fabricius) (Figs. 110, 115)

Papilio lysimnia Fabricius, 1793 [1793-1794] (1): 161 (No locality cited).
Mechanitis lysimnia, Hübner, 1816 [1816-1826]: 11. 1818 [1806-1838], 1: 31; pl. [33], figs. 187, 188. Donovan, 1826 [1822-1834], 4: pl. 120, fig. 1. Doubleday, 1847 [1846-1852]: 130. Prittwitz, 1865: 137. Butler, 1869: 125. Kirby, 1871: 24. Capponnier, 1874: 23. Möschler, 1876: 311. Staudinger, 1885 [1884-1888]: 63. Jones, 1883a: 233. Müller, 1886: 241-242. Haase, 1893: 53. Weymer, 1894: 320. Reuter, 1896: 40. Sanders, 1904: 321. Haensch, 1905: 148. de Silva, 1907: 36; pl. 8, fig. 25. Moulton, 1909: 591, 593; pl. 31, fig. 1, 2. Haensch, 1909: 127; pl. 34b. Weismann, 1913: pl. 2, fig. 15. d'Almeida, 1922: 65. Köhler, 1923: 20. Forbes, 1924: 148, 153, 157. Seitz, 1927: 48. Kremky, 1925: 207-208; figs. 74, 75, pl. 22, fig. 7. Collenette, 1928: 393, 395, 401; pl. 14, fig. 9. Talbot, 1928: 412. Köhler, 1929: 307, 318; pl. 1, fig. 5. Seitz, 1932: 132. Lima, 1936: 209-210. Bryk, 1937: 489-490. Fox, 1940: 182. d'Almeida, 1951: 8, 9-10, 11, 17. Biezanko, 1960a: [2], [4].
Heliconia lysimene Latreille, 1820 [1819-1823]: 200, 218 (*recte lysimnia*).
=*Heliconia narcea* Moreira, 1881: 1-10; pl. 1, fig. 1 (*lapsus* for *nessaea*). d'Almeida, 1922: 65. Bryk, 1937: 490.
[*Mechanitis nessaea* ab. "albescens" Haensch, 1905: 148 (Monte Christo, Brazil).] 1909: 127. d'Almeida, 1922: 65-67. Köhler, 1923: 20.
= *Mechanitis lysimnia albescens* Forbes, 1924: 147, 152. Kremky, 1925: 208. Köhler, 1929: 307, 318. Lima, 1936: 210. Bryk, 1937: 490. Fox, 1940: 182. d'Almeida, 1951: 10, 17. Biezanko, 1960b: [4].

I am not certain as to the location of the type of *lysimnia*, but the figure in Hübner (1818: [1806-1838], 1: pl. [33], figs. 187, 188) can be taken as typical for purposes of identification. The type of "albescens" is in the Berlin Museum; it is also the type of *albescens* Forbes, 1924, the first valid use of the name, an absolute synonym.

The characters differentiating *lysimnia* from *nesaea* were detailed above under the former subspecies; most but not all *lysimnia* have the spot in the forewing apex white.

Specimens examined, 181 ♂, 245 ♀:

BRAZIL: **Goias:** Goias, 1 ♂ 1 ♀ (ZSB). **Bahia:** Bahia, 8 ♂ 10 ♀ (BM). **Minas Gerais:** Cachimbo, Ribeira Jacinto (as "San Jacintho valley"), Minas Serrinha (near Diamantina), Onça (near Pitanguy), Passa Quatro, Sete Lagõas, Minas Gerais, 13 ♂ 26 ♀ (AMNH, BM, CM, MCZ). **Espirito Santo:** Guarujá, Espirito Santo, 3 ♂ 2 ♀ (BM). **Guanabara:** Corcovado, Gavea (?), Itabopoana, Itatiala, Nictheroy, Novo Friburgo, Serra das Orgãos (as "Organ Mts."), Petrópolis, Laguna de Sacuaresma (?), São Antonio dos Brotos, La Tijuca, Tres Rios, Rio de Janeiro, 33 ♂ 50 ♀ (AMNH, BM, CM, MCZ, RM, ZSB). **São Paulo:** Alto de Serra, Anhaugahy (?), Araçatuba, Bauru, Itaquaquecetuba, Rio Preto, Santos, São Paulo, 15 ♂ 19 ♀ (AMNH, BM, MCZ, ZSB). **Paraná:** Castro Caviuna (?), Guarapuava, Rio Iguaçu, 17 ♂ 12 ♀ (AMNH, BM, CAS, JHM). **Santa Catarina:** Blumenau, Caños, Joinvile, Santa Catarina, 12 ♂ 22 ♀ (AMNH, BM, CM, JHM, MCZ, RM). **Rio Grande do Sul:** Eisenau, Hambergo Velho (?), Nova Teutonia, 8 ♂ 9 ♀ (CM, RM, ZSB). **Mato Grosso:** Tombador, 1 ♀ (BM, a stray). **Not located:** Castro Ponta, 1 ♂ (AMNH); Canto Gallo (error ?), 4 ♂ 2 ♀ (MCZ); "Faz. Cayoa", 1 ♂ (MCZ); Suntos (Santos ?), 5 ♀ (AMNH); Tujnea, 2 ♀ (AMNH); illegible label, 1 ♀ (CAS). Brazil: 2 ♂ 12 ♀ (AMNH, BM, CM, MCZ).

Paraguay: Ascuncíon, Carlos Pfanni (?), Coa Guatri, Colonia Independençia, Rio Jejui, Neuva Italia, Nueva Somienia (?), Pastoreo, San José, Supucay (near Villarica), Tacurupucú, Vallarica, Paraguay, 40 ♂ 52 ♀ (AMNH, BM, CM, MCZ, RM, ZSB).

Argentina: **Misiones:** Iguazú, Cataratas del Iguazú, Parque Nacional de Iguazú (as "Rio de Janeiro Nat. Park"), Posadas, 3 ♂ 4 ♀ (BM). **Corrientes:** Isla Entre Ríos, 4 ♀ (BM). **Santa Fé:** Villa Ana, 1 ♀ (BM). **Errors:** La Rioja, Mendoza, 1 ♂ 1 ♀ (BM).

Errors: Honduras, 1 ♂ (CM); Panama, 1 ♀ (MCZ); British Guiana, 3 ♂ 3 ♀ (BM); Popayan (Colombia), 6 ♂ 3 ♀ (BM); Colombia, 2 ♂ (BM); Ecuador, 2 ♀ (BM); Cushi (Peru), 1 ♂ 2 ♀ (BM); Chanchamayo (Peru), 1 ♀ (AMNH); Villa Monier (Bolivia), 1 ♀ (BM).

No Data: 6 ♂ 6 ♀ (BM, CM, RM).

Genus SAIS Hübner

Sais Hübner, 1816 [1816-1826]: 10. Type species, *Sais rosalia* (Cramer), designated by Bates, 1862. Doubleday, 1847 [1846-1852]: 131. Bates, 1862: 497, 527, 528, 537. Kirby, 1871: 22. Scudder, 1875: 264. Staudinger, 1885 [1884-1888]: 61. Schatz, 1887 [1885-1892]: 92, 95; pl. 11. Reuter, 1896: 41, 325, 327, 552. Kaye, 1907: 421. Haensch, 1909: 137. d'Almeida, 1923: 234. Forbes, 1924: 147. Kremky, 1925: 144, 148, 149, 160, 182, 235; figs. 125-127. Bryk, 1937: 538-540. Fox, 1940: 172, 174, 182-183; pl. 8, figs. 52, 53. Forbes, 1941: 4. d'Almeida & Fox, 1941: 1-5; pl. 1. d'Almeida, 1942: 194. Fox, 1949: 11. 1956: 22.

Hübner included two species in *Sais*, *S. rosalia* (Cramer) and *S. pamela* (Cramer), a pierid. Doubleday (1847) listed four species, *rosalia*, his *S. cyrianassa*, which is a *Napeogenes*, and two unnamed

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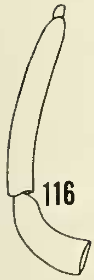
Figs. 116-123, morphological characteristics of the genus *Sais*. Fig. 116, palpus; fig. 117, male foreleg; fig. 118, female foreleg; fig. 119, female foretarsus enlarged; all drawn from *S. r. mosella* (Hewitson) to scales shown.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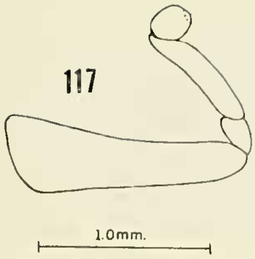
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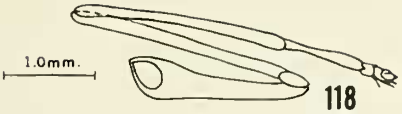
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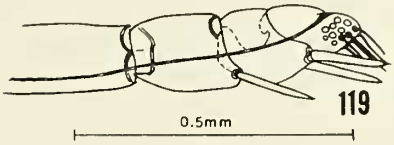
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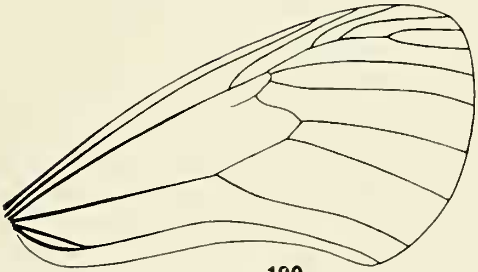
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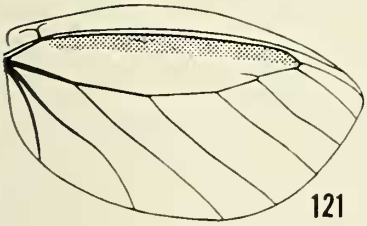
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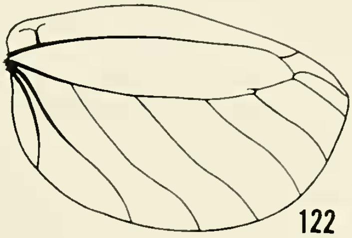
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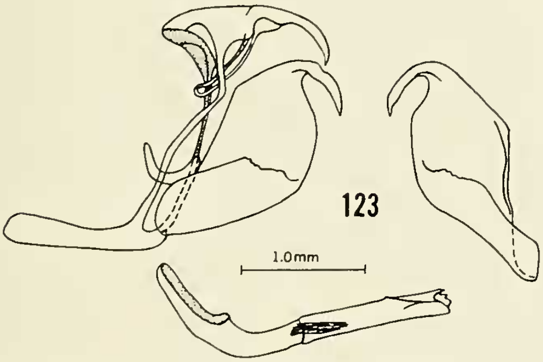

123

Fig. 120, forewing; fig. 121, male hindwing; fig. 122, female hindwing; all drawn from *S. r. rosalia* (Cramer), slightly more than twice natural size. Fig. 123, male genitalia of *S. r. zitella* (Hewitson) from Iquitos, Peru; slide 118, CM; penis and dissected left valve shown separately.

species; his definition of the genus was accordingly conglomerate. Bates (1852) specified *rosalia* as the type-species of *Sais*. Staudinger (1885) included four true *Sais* and one *Ceratinia*. Schatz (1887) presented the first generic diagnosis in the modern sense. Haensch (1909) listed eight subspecies grouped into two species. d'Almeida and Fox (1941) recognized the genus as monotypic, listed five subspecies and synonymized the other names.

Palpus (fig. 116). — proximal segment closely appressed to the head and curved; the lightly curved second segment is free and twice as long as the proximal; the terminal segment is minute, less than one-eighth of the length of the second segment, ovate and pointed.

Antennae. — about three-quarters of the length of the body, half the length of one forewing, with the tips enlarged rather than clubbed.

Forelegs of the male (fig. 117). — coxa stout but small; the femur plus trochanter is about two-thirds as long as the coxa; the tibia is a small knob on the tip of the femur and no larger than the trochanter; the tarsus is represented only as a tiny pointed projection on the spheroid tibia.

Foretarsus of the female (figs. 118, 119). — with four apparent subsegments, the fourth and fifth being fused. Second and third subsegments each bear a pair of terminal spines; beneath each spine and on the next following subsegment is a cluster of trichoid sensilla — two clusters of three on the third subsegment under each spine on the second, two clusters of ten on the terminal subsegment under each spine on the third. Terminal subsegment is more or less ovoid and pointed, with a light dorsal suture indicating the separation between the original two subsegments.

Venation (figs. 120-122). — forewing; R_1 branches near the end of the cell, R_2 well beyond it; M_1 branches from radius and 1d absent; 2d is straight and short; 3d is deeply angled with the upper arm the longer and a strong recurrent vein arises from the apex of the angle; cubitus is "trifid". Hindwing: the humeral is strongly forked, discal cell exceptionally long and reaching nearly to the wing apex. In males Sc and R separate at the humeral and run close together to the wing apex. In females Sc and R are completely coalesced from the base nearly to the end of the cell, where a free segment of Sc angles steeply up to the margin. In both sexes 1d is straight and short, 2d is very lightly angled near its posterior end and so placed as to seem to be part of the cubitus; Rc is minute or wanting; cubitus is apparently four- or even five-branched. In females 2d is longer than the free segment of Sc. The male hair patch is undivided but does not extend the full length of the discal cell from the base; this condition does not represent a reduction of the patch, but rather is the consequence of the elongation of the cell.

Male genitalia (fig. 123). — tegumen is hood-like, separated from the uncus by a faint suture; uncus is a little longer than tegumen, slender, pointed and down-curved at its tip. Gnathos is present as a slender chitinized ribbon supporting a medial membrane. Vinculum is slender, kneed anteriorward just below the level of the costal margin of the valve. Juxta is a flattened V-shaped plate. Penis is one-half longer than tegumen plus uncus and foramen one-fourth the length of the penis, which is arched in its terminal part. Valves are subtriangular, the articulating margin curving evenly to the costal margin, the lower and outer margins curving evenly into each other; apex bears a strong, slender, pointed finger-like projection which is directed down and inward; in the undissected insect these apical processes interlock with the uncus above the penis.

d'Almeida and Fox (1941) pointed out that *Sais* is monotypic. There is reason to believe that this species evolved from the *Mechanitis* stock in relatively recent geologic time. One bit of evidence is afforded by distribution: *Sais rosalia* is absent from Central America and from the higher tropical valleys of the Andes, but is well represented in the Amazon basin. As is typical of much of the butterfly fauna of the Amazon basin, *S. rosalia* is individually so variable that it is difficult to separate it into clear subspecies. Micropopulations and variants have received names in the past, but this is taxonomically unacceptable and sterile, even though the named forms are recognizable. The problem in *Sais* is similar to that in *Mechanitis* — to find a geographic correlation among the maze of morphotypes — and the solutions devised herein for both genera will be unpalatable to those who particularly want to maintain a uniform appearance among the specimens pinned in their cabinets above a label. The peripheral populations are reasonably distinct, but *S. r. promissa* of the middle Amazon basin is so diverse that characteristics of the other subspecies can be found duplicated by individuals from various parts of its range: such individuals have to be called *promissa,* nevertheless — and some of the apparent inconsistencies evaporate when inaccurate locality data are eliminated from consideration.

Collinette's interesting account (1928) of his field work in Mato Grosso provides the only published information on the habits of *Sais.* Like the majority of ithomines, *Sais* was found to prefer shade and not to be strongly attracted to flowers; individuals habitually rest on leaves at the edge of thickets. No record has been published on life history, but presumably *Sais* and *Mechanitis* are much alike in this respect, with various Solanaceae as the larval food plants.

Sais rosalia

The six subspecies are distributed as follows (fig. 124): *S. r. mosella* is known from the Santa Marta range in Colombia east through northern Venezuela; *S. r. rosalia* occurs in Bolívar, Venezuela, the Guianas and thence south near the coast into Maranhõa, Brazil; *S. r. promissa* is found in southern Colombia and in the valleys of the Rios Negro, Solimões, Purús and Madeira in Brazil; *S. r. zitella* flies in eastern Ecuador, northern and central Peru and on the upper Rio Juruá, Brazil; *S. r. badia* occurs in Bolivia, east into Mato Grosso, Brazil; *S. r. rosalinde* comes from Rio Tapajós and Rio Tocatins and thence southeast across Brazil to São Paulo and Guanabara.

Key to Subspecies of Sais rosalia

1. In the area of the hindwing between the median and marginal spots, the veins prominently paler than the spaces between them, so that the two series appear to be connected by blackish, at least in the cubital area .. 2
   The area of the hindwing between the median and marginal spots rather uniformly colored, the veins not especially paler than the spaces between them; marginal spots sometimes a little smudged but not connected to the median spots 3
2. Yellow postmedian fascia of forewing narrower, its costal end about one-fourth as wide as the apical area (measure from top corner of discal cell through dark tooth near base of M_1 and thence to wing apex) .... *S. r. zitella* (Hewitson)
   Yellow postmedian fascia of forewing wider, its costal end at least one-third as wide as the apical area .... *S. r. promissa* Weymer
3. Yellow postmedian fascia of forewing exceptionally narrow, linear, sometimes almost or quite interrupted at M_3; discocellular and cell spots usually (not always) fused and sometimes continuous with a central tawny patch; ground color usually a smokey brown-tawny. .... *S. r. mosella* (Hewitson)
   Yellow postmedian fascia of forewing not linear, never almost interrupted at M_3; discocellular and cell spots usually (not always) separate and never connected with the comma mark. 4
4. Forewing apical area with a large tawny spot rimmed with black; yellow usually (not always) present in hindwing cell, at least on underside. .... *S. r. rosalia* (Cramer)
   Forewing apical area solid black on upperside or with narrow tawny streaks between some of the veins, and always with tawny on the underside: hindwing cell almost always lacking yellow on either side. 5

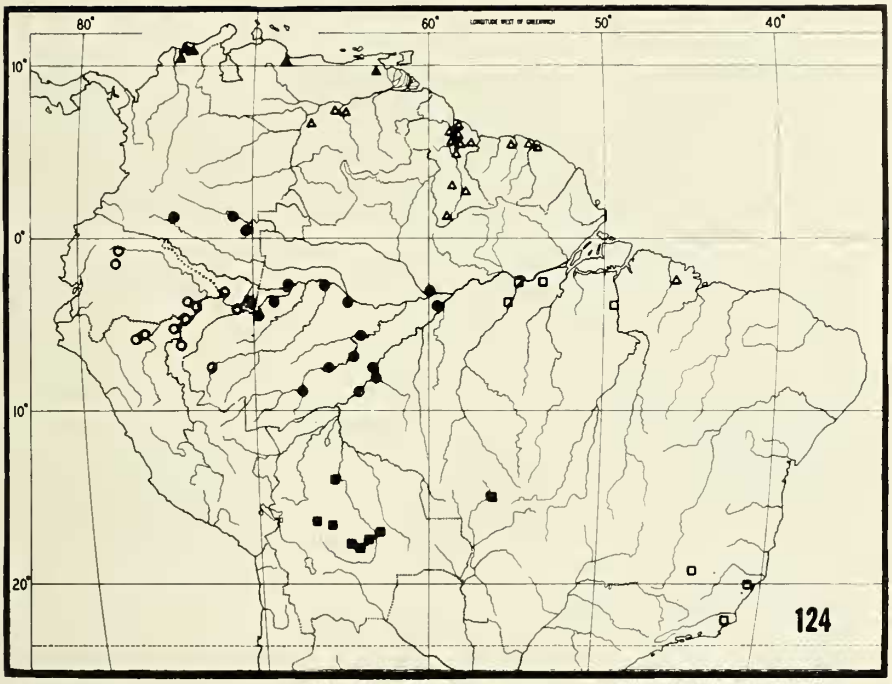


Fig. 124, South America, showing distribution of subspecies of *S. rosalia*: solid triangles, *S. r. mosella* (Hewitson); open triangles, *S. r. rosalia* (Cramer); solid circles, *S. r. promissa* Weymer; open circles, *S. r. zitella* (Hewitson); solid squares, *S. r. badia* Haensch; open squares, *S. r. rosalinde* Weymer.

5. Ground color a dark brownish red-tawny; forewing discocellular spot wider than the yellow at the lower end of the postmedian fascia separating it from the comma mark; yellow postmedian fascia about one-third as wide as the apical area. .... *S. r. badia* Haensch
   Ground color a lighter ochre to reddish tawny; forewing discocellular spot narrower than the yellow separating it from the comma mark; yellow postmedian fascia almost as wide as the apical area. .... *S. r. rosalinde* Weymer

Sais rosalia mosella (Hewitson) (Figs. 116-119, 124, 125)

Ithomia mosella Hewitson, 1867 [1852-1876], 4: [19]: pl. [11], fig. 154 (Venezuela). Riley & Gabriel, 1925: 34.

Sais mosella, Kirby, 1871: 23. Staudinger, 1885 [1884-1888]: 61. Schatz, 1886 [1885-1892]: pl. 11. 1887 [1885-1892]: 95. Haensch, 1909: 137; pl. 36c. Kremky, 1925: 235; figs. 125-127. Bryk, 1937: 539. Fox, 1940: 183. Forbes, 1940: 313. d'Almeida & Fox, 1941: 3, 5; figs. 1, 2. Lichy, 1943: 210.

=*Sais rosalia virchowii* Dewitz, 1877: 87; pl. 2, fig. 4 (Venezuela). Haensch, 1909: 137 (as *virchovi*). Seitz, 1910: 171 (*as virschovi*). Bryk, 1937: 540. Fox, 1940: 183. d'Almeida & Fox, 1941: 4 (synonymy).

The type of *mosella* is a male from Venezuela, number 7249 in the British Museum (Natural History). The type of *virchowii* is in the Berlin Museum.

Normal variation includes specimens with the apex of the forewing entirely black (*virchowii*), though most have a prominent tawny patch in the apex; the ground color usually is browner and darker than the illustration in Seitz (Haensch, 1909: fig. 36c) or Hewitson's figure. A few Santa Marta individuals have some yellow in the hindwing cell, but differ from *r. rosalia* by the exceedingly narrow linear yellow forewing fascia. The range extends from the Santa Marta region of Colombia east through northern Venezuela.

Specimens examined, 117 ♂, 33 ♀:

Colombia: **Magdalena:** Aracataca, San Juan de Ciénaga, Rio Magdalena, Santa Marta mountains, Oreuca (Onaca ?), 44 ♂ 2 ♀ (BM, CM, PM). **Vague:** New Grenada, Colombia, 9 ♂ 2 ♀ (AMNH, CM, USNM).

Venezuela: **Carabobo:** San Esteban, Puerto Cabello, Las Quiguas, Valencia, 25 ♂ 16 ♀ (BM, CM, PM, RM, ZSB). **Monaguas:** Temblador, 2 ♂ (PM). **Vague:** Venezuela, Northern Venezuela, 31 ♂ 8 ♀ (BM, CM, PM, USNM).

Errors: Chirioni, Peru (Rio Chiruri, Venezuela ?), 1 ♂ (BM). Northeastern Peru, 1 ♂ (AMNH). Villa France, Brazil, 2 ♂ 2 ♀ (BM).

No Data: 2 ♂ 3 ♀ (BM, MCZ).

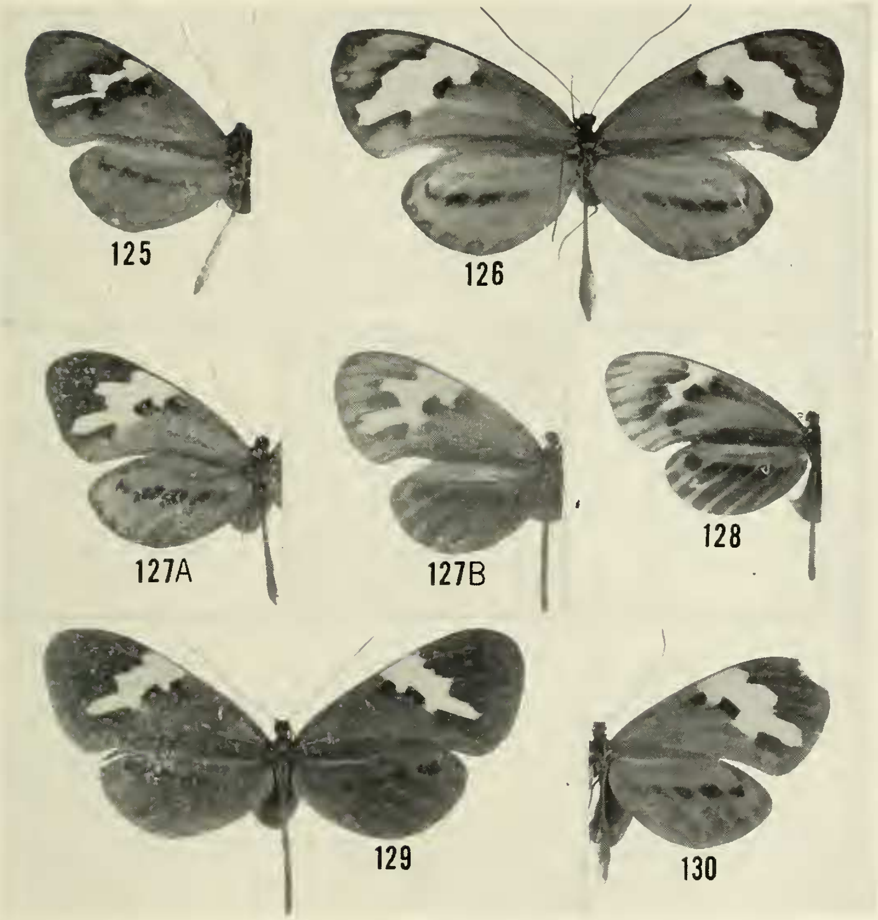
Sais rosalia rosalia (Cramer) (Figs. 120-122, 124, 126)

Papilio rosalia Cramer, 1779 [1775-1791], 3: 89; pl. 246, fig. B (Surinam). Fabricius, 1787, 2: 15. Herbst, 1790: 103; pl. 68, fig. 8. Fabricius, 1793, 3: 172.

Sais rosalia, Hübner, 1816 [1816-1826]: 10. Doubleday, 1847 [1846-1852]: 133. Ménétriés, 1855: 20. Bates, 1862: 527. Butler, 1869: 125. Kirby, 1871: 22-23. Scudder, 1875: 264. Möschler, 1876: 310. Haensch, 1905: 161. Fruhstorfer, 1907: 123. Haensch, 1909: 137. Bryk, 1937: 538-539. Hall, 1940: 6. Fox, 1940: 207; pl. 8, figs. 52, 53. d'Almeida & Fox, 1941: 1, 3-4; figs. 1, 3. d'Almeida, 1942: 194. Lichy, 1943: 210.

Heliconia rosalia, Latreille, 1819 [1819-1823]: 220.

=*Sais camariensis* Haensch, 1905: 162; pl. 4, fig. 12 (Camaria, British Guiana). 1909: 137. Aurivillius, 1929: 155 (as *camoriensis*). Bryk, 1937: 539. Fox, 1940: 207. Hall, 1940: 6.



Figs. 125-130. Fig. 125, *S. r. mosella* (Hewitson), ♂, San Esteban, Carabobo, Venezuela, CM. Fig. 126, *S. r. rosalia* (Cramer), neotype ♂, Kibilebo Rivier, Surinam, CM. Fig. 127, *S. r. promissa* Weymer; fig. 127A, a dark ♂, Rio Ortegazua, Caquetá, Colombia, CM; fig. 127B, a light ♂, Loreto-Yacu, Amazonas, Colombia, CM. Fig. 128, *S. r. zitella* (Hewitson), ♂, Iquitos, Peru, CM. Fig. 129, *S. r. badia* Haensch, ♂, Cuatro Ojos, Santa Cruz, Bolivia, CM. Fig. 130, *S. r. rosalinde* Weymer, ♂, Alcobaça, Pará, Brazil, CM. Natural size.

The type of *rosalia* is apparently lost. In order to preserve the name in the generally understood context, a male in Carnegie Museum from Tijgerdam, Kibilebo Rivier, Suriname; M. De La Fuente; July 1966, is hereby designated the neotype (fig. 126). This specimen agrees well with Cramer's illustration, particularly in the absence of yellow in the hindwing discal cell on the upperside, though on the underside there is some slight yellow scaling.

The type of *camariensis* is in the Berlin Museum.

Authentic records indicate that *S. r. rosalia* is continuously distributed from Rio Suapure, Bolívar, Venezuela, east throughout the Guianas, with a colony in coastal Maranhõa, Brazil. *S. rosalia* is uncommon everywhere, and it seems likely that this outpost represents the extreme of distribution for the subspecies and that more intensive field work will demonstrate the butterfly's presence in the intervening area in coastal Brazil.

Specimens examined, 152 ♂, 31 ♀:

VENEZUELA: Bolívar: Libertad, Maripa, Rio Mato, Rio Suapure, La Unión, La Vuelta (Rio Caura), 66 ♂ (AMNH, BM, CM, MCZ, PM). Vague: Venezuela, 1 ♀ (ZSB).

GUYANA: Arowini Creek (?), Bartica, Berbice, Demerara, Georgetown, Kartabo, Kuyuwini River, Matope [Falls], Mazaruni River, Moraballi River, New River, Rockstone, Rupununi [River], Shudikar-wau River [as Shudihar], British Guiana, 24 ♂ 14 ♀ (AMNH, BM, CM, USNM).

SURINAM: Albina (?), Aroewarwa Rivier, Kibilebo Rivier, Surinam, 6 ♂ (BM, CM, RM).

FRENCH GUIANA: Maroni Riviér, St. Jean, St. Laurent, Cayenne, French Guiana, 36 ♂ 12 ♀ (AMNH, BM, PM, RM, USNM).

BRAZIL: Maranhao: Mt. Aureos, Maranhão, 3 ♂ (BM). Vague: Brazil, Lower Amazon River, 4 ♂ (AMNH, MCZ).

ERRORS: "Amaz. Sup.", 1 ♂ (USNM); Bogotá, 3 ♂ (CM).

NO DATA or "South America": 9 ♂ 4 ♀ (AMNH, BM, PM, USNM).

Sais rosalia promissa Weymer (Figs. 124, 127)

Sais promissa Weymer, 1884: 11; pl. 2, fig. 4 (Tabatinga). Srnka, 1884: 296-297. Staudinger, 1885 [1884-1888]: 61. Reuter, 1896: 41-42. Avinoff, 1926: 364. Bryk, 1937: 540. Fox, 1940: 183. d'Almeida & Fox, 1941: 5; fig. 1.

=*Sais promissa klagesi* Avinoff, 1926: 364; pl. 33, fig. 8 (Hyutanahan, Purús, Brazil). Bryk, 1937: 540. Fox, 1940: 183. d'Almeida & Fox, 1941: 5 (synonymy).

=*Sais promissa schatzi* Zikan, 1941 [1940-1942]: 22 (São Gabriel, Rio Negro).

=*Sais promissa huebneri* Zikan, 1941 [1940-1942]:22 (Rio Purús).

=*Sais rosalia sanctibernardi* Bryk, 1953: 37-38 (San Berardo, Rio Papury).

The type of *promissa* is a male from Tabatinga in the Berlin Museum. The type of *klagesi* is a male from Hyutanaha, Rio Purús, Brazil, and, with five male paratypes is in Carnegie Museum. The types of *schatzi* and *huebneri* are in the Instituto Oswaldo Cruz, Rio de Janeiro (according to d'Almeida, 1956). The type of *sanctibernardi* is in the Stockholm Museum and was lent to me for study.

As here defined, *promissa* occupies the areas of the Rios Solimões, Purús, Madeira and Negro, west into the territories of Vaupés, Caquetá and Amazonas in Colombia. Within this region, *Sais rosalia* is highly variable and, except in the center of its distribution, tends to blend with adjacent subspecies. Variability is attested by the synonymy. Three of the five names listed were given to recognizably different-looking insects: *promissa* and *klagesi* have very wide yellow postmedian fascia on the forewings, the former has the forewing apex tawny with black streaks and a lighter tawny ground color, the latter has the apex black or with only faint tawny streaks and a mahogany ground color; *schatzi* has the yellow postmedian fascia narrower, though not nearly as narrow as in *mosella* or *zitella*. The other two names are synonyms of synonyms, as it were; *huebneri* is a redescription of *klagesi* and *sanctibernardi* is typical *promissa*. Because none of these variations appears to have any geographic correlation, it is necessary to comprise all of them as a single subspecies.

Specimens examined, 136 ♂, 38 ♀:

COLOMBIA: Vaupés: Cano Carurú (Rio Cairary), San Bernardo (Rio Papury), 8 ♂ 3 ♀ (AMNH, CM, ST). Caquetá: Rio Orteguaza, 58 ♂ 9 ♀ (AMNH, CM). Amazonas: Caucaya, Rio Loreta-yacu, Rio Putumayo, 12 ♂ 4 ♀ (AMNH, CM).

BRAZIL: Amazonas: Alliança (Rio Madeira), Alliança (Rio Purús), Bôca do Acre (Rio Purús), Calama, Fonte Bôa, Humaytá (Rio Madeira), Hyatanahã, Rio Madeira, Manáos, Nova Olinda (Rio Purús), [above] Obidos, Rio Purús, São Paulo de Olivençia, Tabatinga, Teffé, Tonatins, 49 ♂ 16 ♀ (BM, CM, MCZ, PM, ZSB). Guaporé: Porto Velho, Victoria, 4 ♂ 1 ♀ (BM). Vague: Amazons, Upper Amazons, 3 ♂ 2 ♀ (BM, CM, PM, USNM). Not located: Doma [Fonte Bôa ?], 2 ♀ (BM).

ERRORS: Cayenne, 1 ♀ (CM); Rio Massauri (Pará), 1 ♂ (BM); Pebas (Peru), 1 ♂ (BM).

Sais rosalia zitella (Hewitson) (Figs. 123, 124, 128)

Ithomia zitella Hewitson, 1868 [1852-1876], 4: [22]; pl. [12], fig. 167 (Nauta). Riley & Gabriel, 1925: 53.

Sais zitella, Kirby, 1871: 23. Druce, 1876: 208. Weymer, 1884: 12. Staudinger, 1884 [1884-1888]: pl. 28. 1885 [1884-1888]: 61. Weymer, 1890: 80. Haensch, 1909: 137; pl. 36c. Forbes, 1927: 31. Bryk, 1937: 540. Fox, 1940: 183. d'Almeida & Fox, 1941: 4; figs. 1, 3. Zikan, 1941 [1940-1942]: 22.

The type is a male from Nauta, Loreto, Peru, number 7250 in the British Museum (Natural History).

Authentic records are from Oriente, Ecuador, Loreto, Peru and the upper Jurúa, Brazil. This subspecies differs from *promissa* in that the yellow postmedian fascia of the forewing always is narrow, sometimes is nearly extinct and the lower end (in M_3-Cu_1) always stops much farther from the wing margin. These features are not unlike those of *mosella*, but *zitella* always has a heavily striped hindwing.

Specimens examined, 78 ♂, 11 ♀:

COLOMBIA: **Amazonas:** Igarapé Florida, Isla la Ronda, 2 ♂ (AMNH, BM).

ECUADOR: **Oriente:** Aguano, Rio Napo, 3 ♂ (BM).

PERU: **Loreto:** Caballococha, Rio Cachiyacu (near Iquitos), Chambireyacu (near Yurimaguas), Iquitos, Rio Itaya, Rio Marañon, Nauta, Rio Pacaya, Pébas, lower Rio Tapiche, Rio Ucayali, Yurimaguas, 53 ♂ 10 ♀ (AMNH, BM, CM, RM, ZSB). **Vague:** Peru, 4 ♂ (AMNH, BM, USNM).

BRAZIL: **Amazonas:** (upper) Rio Jurúa, 2 ♂ (AMNH, MCZ). **Vague:** Amazons, upper Amazons, 7 ♂ 1 ♀ (AMNH, CM, MCZ, USNM).

ERRORS: Ega, Brazil, 1 ♂ (BM); Sucre, Bolivia, 1 ♂ (RM).

NO DATA: 5 ♂ (BM, MCZ, PM).

Sais rosalia badia Haensch (Figs. 124, 129)

Sais badia Haensch, 1905: 162 (Upper Amazons). 1909: 137. Bryk, 1937: 539. d'Almeida & Fox, 1941: 3. d'Almeida, 1952: 2-3.

=*Sais rosalia brasiliensis* Talbot, 1928: 412; pl. 14, fig. 12 (Rio Serragem, Mato Grosso). Collinette, 1928, 401, 416; pl. 16, fig. 9. Gabriel, 1932: 12. Bryk, 1937: 539. d'Almeida, 1939: 81. d'Almeida & Fox, 1941: 5.

The type of *badia* is in the British Museum. The holotype of *brasiliensis* is a male numbered 18433 and the allotype female is numbered 18434 in the British Museum (Natural History); the type series was taken by Collinette on the northwestern plateau of Mato Grosso near Diamantino.

d'Almeida (1952) was the first to notice that Bolivian *Sais* agrees with Haensch's brief description of *badia*, founded on a single male with spurious locality data. The yellow postmedian fascia of the forewing is relatively narrower in *badia* than in *rosalinde* and the yellow distal projection at M_2 is angled rather than curved. The ground color is generally browner, almost as in *mosella*.

Specimens examined, 33 ♂, 10 ♀:

Bolivia: **Cochabamba:** Chapare, Rio Chipiriri, Rio Cristalmayo, Todos Santos, Yungas de Palmar, 12 ♂ (CM, JHM, ZSB). **Santa Cruz:** Buenavista, Cuatro Ojos, Los Juntas, Rio Mamoré, 10 ♂ 3 ♀ (CM).

Brazil: **Mato Grosso:** Tombador, Mato Grosso, 5 ♂ 7 ♀ (BM).

Sais rosalia rosalinde Weymer (Figs. 124, 130)

[*Sais rosalia* variation, Bates, 1862: 527.] Butler, 1877: 108. Sharpe, 1890: 559.

Sais rosalia rosalinde Weymer, 1890: 87 (Rio Tocatins). Bryk, 1937: 539. d'Almeida, 1939: 81. d'Almeida & Fox, 1941: 5. d'Almeida, 1952: 2-3.

=*Sais paraensis* Haensch, 1905: 161 (Rio Tocatins). 1909: 137; pl. 36a. Avinoff, 1926: 364. Ribeiro, 1931: 44. Bryk, 1937: 539. d'Almeida, 1939: 81. Fox, 1940: 183. d'Almeida & Fox, 1941: 3 (synonymy). Lichy, 1943: 210.

The types of *rosalinde* and *paraensis* are in the Berlin Museum.

Because of the poor presentation of the description of *rosalinde*, the name went unnoticed for many years; *paraensis* is an inadvertent synonym. The subspecies is distributed from the Rio Tocatins south to São Paulo in Brazil.

Specimens examined, 49 ♂, 12 ♀:

Brazil: **Pará:** Alcobaça, Capella, Itaituba, Rio Tapojós, Villa Franca, Pará, Lower Amazons, 32 ♂ 7 ♀ (AMNH, BM, CM, JHM, USNM, ZSB). **Minas Geraes:** Minas Geraes, 1 ♂ (PM). **Espirito Santo:** Espirito Santo, 1 ♂ (ZSB). **São Paulo:** Anhangahy (?), São Paulo, 8 ♂ 3 ♀ (BM, MCZ). **Guanabara:** Rio de Janeiro: 1 ♂ (MCZ).

Errors: Colombia, 1 ♂ (BM); St. Vincente, Colombia, 1 ♂ (USNM); Amaz. Sup., 1 ♀ (CM); San Mateo, Bolivia, 1 ♂ (BM).

No Data: 3 ♂ 1 ♀ (BM).

Genus SCADA Kirby

Scada Kirby, 1871: 23. Type species: *Oleria theaphia* Bates, designated by Kirby, 1873: 359. Scudder, 1875: 232, 266. Godman & Salvin, 1879 [1879-1901]: 14. Staudinger, 1885 [1884-1888]: 61. Schatz, 1887 [1885-1892]: 95; pl. 11. Kirby, 1908 [1894-1912]: 8. Kaye, 1905: 120. Haensch, 1909: 137. d'Almeida, 1923: 234. Forbes, 1924: 147. Kremky, 1925: 144, 147-149, 160, 180, 182, 235-237: figs. 128-131, pl. 25, fig. 6. Bryk, 1937: 540-543. Fox, 1940: 164, 171, 172, 183-184; pl. 8, figs. 47, 48. Forbes, 1940: 309. Forbes, 1941: 4. d'Almeida, 1942: 195. Fox, 1949: 11. 1956: 22.

=*Salacia* Hübner, 1823 [1816-1827], 2: 25; figs. 2239-2240. Type species: *Salacia phyllodoce* Hübner, by monotypy. Preoccupied, Lamouroux, 1816. Scudder, 1875: 264. Fox, 1940: 183. d'Almeida, 1942: 194.

=*Heteroscada* Schatz, 1886 [1885-1892]: 87, 91; pl. 11. Type species: *Heteroscada gazoria* (Godart), designated by Bryk, 1937. Kaye, 1905: 120. Haensch, 1909: 134. d'Almeida, 1923: 234. Forbes, 1924: 147. Bryk, 1937: 525-526. d'Almeida, 1939: 78-79. Fox, 1940: 183. d'Almeida, 1942: 186.

Papilio Drury (part), 1782 [1770-1782], 3: pl. 13, figs. 5, 6. Herbst, 1792: 26.

Nereis Hübner (part), 1808 [1806-1838], 1: pl. 3, figs. 1-4. Hemming, 1934: 27. d'Almeida, 1942: 189-192.

Aeria Hübner (part), 1816 [1816-1826]: 9.

Heliconia, Latreille (part), 1820 [1819-1923]: 199, 214.

Ithomia, Hewitson (part), 1852-1876.

Mechanitis Bates (part), 1862: 529. Druce, 1876: 208; pl. 17, fig. 5.

Oleria Bates (part), 1862: 529. Herrich-Schäffer, 1864 [1864-1865], 1: 47. C. & R. Felder, 1865: [1864-1867]: 367.

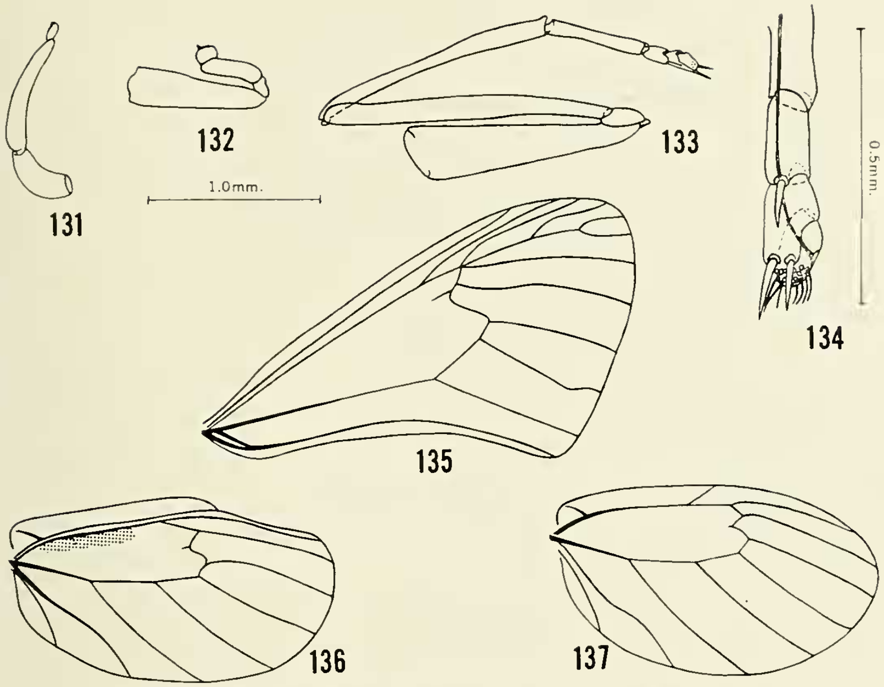
Melinaea Kirby (part), 1871a: 34.

Kirby proposed *Scada* to replace the preoccupied *Salacia* Hübner and included eight species, seven of which were correctly associated. During the previous decade these species had been variously assigned to *Ithomia, Mechanitis, Mechanitis* (*Oleria*) or *Oleria*. *Heteroscada* was a blunder: apparently Schatz confounded the characters of male *Scada karschina* and female *Hyalyris fenella*. Since the name is an absolute synonym, as was pointed out by Forbes (1924) and d'Almeida (1939), it probably matters little whether it is credited to Schatz alone or, as d'Almeida (1939) did, to Schatz and Röber; in any event, the text as edited by Röber after Schatz' death, credits Schatz alone.

Palpus (fig. 131). — the basal segment curved and closely appressed to the head; second segment about twice the length of the first, lightly curved and standing free; terminal segment about one-tenth the length of the second, ovate.

Antennae. — about three-quarters the length of the entire body and its tip not quite reaching the end of the forewing cell.

Male foreleg (fig. 132). — very strongly reduced; coxa stout but miniaturized; femur short, slender; femur plus trochanter a little more than half the length of the coxa; tibia reduced to a round knob on which the aborted



Figs. 131-137, morphological characteristics of the genus *Scada*. Fig. 131, palpus; fig. 132, male foreleg, both of *S. theaphia* (Bates); fig. 133, female foreleg; fig. 134, female foretarsus, both of *S. batesi* Haensch, all drawn to scales shown. Fig. 135, forewing; fig. 136, male hindwing; fig. 137, female hindwing of *S. batesi* Haensch, about three times natural size.

tarsus is present as a tiny pointed projection and together they are only one-eighth the length of the coxa.

Female foreleg (figs. 133, 134). — miniaturized; femur longer than tibia and the tarsus about two-thirds the length of the tibia. Tarsus apparently with four subsegments, the fourth and fifth being fused and the post-tarsus vestigial: third subsegment shortened, a little thickened distad; second subcylindric, one-fourth the length of the first; first slender, twice as long as the other subsegments together. A pair of spines each on the second and third subsegments.

Venation (figs. 135-137). — R_2 of forewing arising at or beyond the end of the cell; 1d wanting and M_1 branching from R, or (rarely) 1d present but minute; 2d straight, forming an acute inner angle with R; 3d from one and a half to twice the length of 2d, usually angled near its anterior end; Rc well developed, arising from the angle of 3d or from a point opposite M_2. An aberration in venation is noted in a female of *S. zibia*: in addition to the arrangement of veins described above, there is an auxiliary vein angling up from M_2 and connecting with an angle of M_1, the whole arrangement having the aspect of a Y, with M_1 as the foot.

Hindwing. — venation fairly uniform throughout the genus. Humeral vein simple, angled back from the base of R-Sc. In males, Sc and R run together for a short distance beyond the humeral and after separating, Sc runs quite close to R as far as the end of the cell, then curves up and runs to the margin. In females, R and Sc are anastomosed for three-quarters of the length of the cell, then Sc angles steeply up to the margin, the free segment being shorter than 2d. In both sexes 1d is present, short in females, often nearly as long as 2d in males; 2d bears the brief Rc at its midpoint, where it is angled, the two arms being equal; in *reckia* 2d is longer and is angled but little, being almost straight or else gently curved; 3d present, as long as and parallel to the upper arm of 2d. Wing of the "quadrifid" type.

In males, the hind wing between Sc and R bulges, forming a depression on the ventral side, with the hair patch on the dorsal convex side. Although this hair patch is single, a primitively distal part is missing and the patch must be regarded as being reduced. It extends from the base only two-thirds of the distance to the end of the cell.

Male genitalia (figs. 139-144, 152-157, 168-170). — the most distinctive feature is the long, finger-like process arising at the base of the sacculus and crossing the inner face of the valve diagonally. The terminal third of this ventral process is clothed with hairs and scales. In general, the valves are rather rectangular with the outer margin deeply curved. The costal margin bears two projections, formed variously according to the species, one at the apex and one near the vinculum. The articulating margin is deeply excavated (as far as sclerotized tissue is concerned) in many species and the actual articulation with the vinculum for the most part is by means of unsclerotized membrane. The valves also are connected to the gnathal membrane at the base of the costa and at the sacculus they are mutually connected to the juxta.

The tegumen is short, not projecting much anteriorad, and divided from the uncus by an evident suture. The uncus is curved and shaped in various ways according to the species, but the basic form probably is a slender, pointed, gently down-curved structure. The saccus is no longer than the tegumen plus uncus, moderately slender. Penis is a little longer than the diagonal length of the valve proper, straight with tapering unarmed tip; foramen is slightly more than one-fourth the length of the penis. Vinculum not strongly kneed. Gnathos mostly membranous, supported laterally by slender sclerotized projections beneath the tegumen-gnathal suture; these projections are continuous with the membrane itself, not separate structures.

Key to the Species of Scada by Male Genitalia

1. Valve with two slender finger-like processes, the ventral process present in all *Scada*, plus a process arising at the anterior end of the costal margin; costal margin nearly straight or only lightly concave .... (*zibia*-group) 2

Valve with only the ventral process present, the anterior end of the deeply concave costal margin sometimes with a large tooth or a rounded projection but never with a finger-like process 4

2. Less than 10% of the ventral process extending beyond the apex of the valve (Fig. 170) .... *S. batesi* Haensch

More than 10% of the ventral process extending beyond valve apex 3

3. About 15% of ventral process extending beyond valve apex (Fig. 169) .... *S. quotidiana* Haensch

More than 25% of ventral process extending beyond valve apex (Fig. 168) .... *S. zibia* (Hewitson)

4. Uncus, viewed from above, tapered evenly to a point .. (*zemira*-group) .. 5

Uncus, viewed from above, terminally expanded .... (*ethica*-group) 10

5. More than 10% of ventral process projecting beyond valve apex 6

Less than 10% of ventral process projecting beyond valve apex 9

6. Uncus, viewed from side, lightly down-curved at an angle of about 45° with the line of the saccus; concavity of costal margin of valve formed by two straight lines placed at an angle 7

Uncus, viewed from side, strongly down-curved to an angle of about 90° 8

7. Ventral process longer than valve by one-fourth the latter's height; costal concavity with the line to apex longer than the line to the anterior projection; penis slightly longer than height of valve (Fig. 144) .... *S. karschina* (Herbst)

Ventral process longer than valve by one-seventh the latter's height; costal concavity with line to apex and line to anterior projection equal; penis the same length as height of valve (Fig. 143) .... *S. delicata* Kaye

8. Costal concavity angled; penis a little longer than height of valve (Fig. 140) .... *S. kusa* (Hewitson)

Costal concavity evenly curved; penis the same length as height of valve (Fig. 141) .... *S. ortygia* (Druce)

9. Apex of valve acute, about the same height as the angled anterior tooth, the costal concavity angled (Fig. 142) .... *S. huascara* new species

Apex of valve rounded, higher than rounded anterior projection, the costal concavity evenly curved (Fig. 139) .... *S. zemira* (Hewitson)

10. Penis shorter, about 15% longer than height of valve 11

Penis longer, 30 to 55% longer than height of valve 12

11. Uncus, viewed from above, gradually widened to a rounded tip (fig. 152) .... *S. ethica* (Hewitson)

Uncus, viewed from above, abruptly widened and its tip lightly bifurcate (fig. 156) .... *S. majuscula* Haensch

12. Uncus, viewed from above, greatly widened, the breadth of the widened part equal its length, the tip concave (fig. 157) .... *S. philemon* (Felder)

Uncus, viewed from above, only moderately widened, the breadth of the widened part less than its length, the tip variously shaped but not concave 13

13. Uncus, viewed from above, with the sides of the widened part straight and parallel, the tips squared or very lightly notched and the proximal end abruptly curved into the narrower neck (fig. 153) .... *S. reckia* (Hübner)
    Uncus, viewed from above, with the sides of the widened part convex, not straight, and the proximal end gently curved into the narrower neck 14
14. Viewed from above, tip of uncus rounded; anterior projection of valve rounded (fig. 154) .... *S. theaphia* (Bates)
    Viewed from above, tip of uncus squared; anterior projection of valve pointed, tooth-like (fig. 155) .... *S. echo* new species

On the basis of male genitalia, *Scada* species fall into three groups which seem much more natural than groupings based on the wing pattern or the coloring of the collar and patagia.

The *zemira*-group has the least specialized genitalia, lacking the flattened, terminally widened and often bifurcate uncus characteristic of the *ethica*-group, or the finger-like anterior costal process characteristic of the *zibia*-group. *S. zemira* itself has the most complete pattern and apparently is the most primitive surviving *Scada,* though it certainly cannot be considered to be ancestral to any other member of the genus. The pattern of *kusa, ortygia* and *husacara* are reduced to translucent discs with dark margins and a dark diagonal bar on the forewings, and even these dark markings have been lost in *karschina,* which has the most evolved (simplified) pattern in the entire tribe.

Of the *ethica*-group, *S. ethica* has discal markings on the hindwing and is easily recognized, but the other five species are all much alike and difficult to distinguish externally from one another or from members of the *zibia*-group, though the genitalia are distinctive. The most evolved pattern is found in *reckia,* which lacks the submarginal spots on the upper side, but the most evolved genitalia are found in *philemon,* in which the uncus is grotesquely widened and bifurcate.

The *zibia*-group comprises three species: *zibia* with three subspecies, *quotidiana* with two, and *batesi.* The last has been associated by others with *theaphia* because of the similarly colored collars and patagia, but the genitalia show that the two species belong to entirely different groups. The extraordinary valves of the *zibia*-group suggest that it is the most evolved.

Key to the Species and Subspecies of Scada

1\. Collar tawny 2
Collar black 7

2\. Patagia entirely tawny 3
Patagia tawny with a black fringe 4

3\. Collar tawny with a pair of white lateral spots; wings rather opaque with heavy black borders and a slender forewing cross bar; white submarginal spots present on under side .... *S. delicata* Talbot
No white lateral spots on collar; wings translucent with yellow discs and blackened margins with no sharp line between the two colors; no forewing cross bar and no submarginal spots .... *S. karschina* (Herbst)

4\. A tawny spot at anal angle of forewing; black markings extensive, the yellow reduced to narrow streaks .... *S. zemira* (Hewitson)
No tawny on upper side of forewing 5

5\. Submarginal white spot R-M$_1$ of forewing greatly elongated, 2.5 to 3 mm. long, and the two spots R$_3$-R$_5$ minute, round; discal cross bar and black apex both wider than yellow postmedian patch .. *S. z. zibia* (Hewitson)
Submarginal white spot R-M$_1$ of forewing rounded or but little elongated, shorter than 2.5 mm.; discal cross bar not as wide as the yellow postmedian patch 6

6\. Black cross bar of forewing strong, somewhat wider at the costa; yellow on discs of both wings nearly opaque .... *S. z. xanthina* (Bates)
Black cross bar of forewing weak, not wider at the costa; yellow on discs of both wings strongly translucent .... *S. z. zeroca* new subspecies

7\. Patagia solid black 9
Patagia partly tawny 8

8\. Patagia tawny with a black fringe; margins solid above, the white submarginal spots present only on under side .... *S. reckia* (Hübner)
Patagia black with a small tawny dot at its base; white submarginal spots present only on the under side .... *S. huascara* new species

9\. Forewing cross bar angled or zigzag, the segment over Cu$_1$ not in line with the part over the discocellulars and always thinner, sometimes absent; hindwing often with a spot or forked bar on the disc 10
Forewing cross bar straight or only very lightly curved, not angled or zigzag; hindwing rarely with a forked bar on the disc 12

10\. Submarginal spot M$_3$-Cu$_1$ of forewing larger than or the same size as the spot in Cu$_1$-Cu$_2$ and the black margin the same width in both cells .... *S. ethica* (Hewitson)
Submarginal spot M$_3$-Cu$_1$ of forewing smaller than spot Cu$_1$-Cu$_2$ and the black margin noticeably wider below Cu$_1$ than above it .... (*quotidiana*) 11

11\. Forewing cross bar with segment over Cu$_1$ thin or absent and the part over the discocellulars widened and squared; discal spot of hindwing extending in over the end of the cell .... *S. q. perpuncta* Kaye

Forewing cross bar with the segment over Cu$_1$ narrow but well developed; hindwing forked bar, when present, not covering the end of the discal cell .... *S. q. quotidiana* Haensch

12\. Tawny scaling present on the under side in the hindwing margin, in the forewing apex or anal angle or in several or all of these places 13

No tawny scaling anywhere on under side 15

13\. The only tawny present on under side is a tiny dot at or near the fork of R$_4$ and R$_5$ in forewing apex .... *S. m. junina* Bryk

Tawny scaling present in hindwing under side margin near M$_3$ 14

14\. Most individuals with black margins wider, so that the black segment of M$_3$ of hindwing is longer than the yellow segment; reliable identification only with male genitalia; Bolíver, Venezuela, and British Guiana .... *S. m. majuscula* Haensch

Most individuals with black margins narrower, so that the black segment of M$_3$ of hindwing is shorter than the yellow segment; reliable identification only with male genitalia; Amapá, Pará and Maranhõa, Brazil .... *S. theaphia* (Bates)

15\. White submarginal spots absent on upper side and present on under side only near the apices .... *S. ortygia* (Druce)

White submarginal spots present on upper side, at least in forewing apex 16

16\. Submarginal spots absent below M$_3$ on both sides of forewing .... *S. echo* new species

Submarginal spots present below M$_3$ of forewing, at least on under side 17

17\. Margins very wide, the yellow segment of M$_3$ of hindwing no more than ⅓ the length of black segment; cross bar of forewing usually (not always) with a branch over cubitus (4d) isolating a yellow spot in Cu$_1$-Cu$_2$ .... *S. kusa* (Hewitson)

Dark margins less wide, the yellow segment of M$_3$ of hindwing at least ½ the length of the black segment 18

18\. Yellow postmedian patch of forewing narrower, about the same width as the black apex; submarginal spots of forewing apex round; hindwing exceptionally with a forked bar on disc; only male genitalia provide certain identification; eastern Colombia, eastern Ecuador, eastern Peru, western Brazil .... *S. batesi* Haensch

Yellow postmedian patch of forewing wider than the black apex; submarginal spots in forewing apex often slightly elongated; hindwing never with a discal spot or bar; only male genitalia provide certain identification; Surinam, French Guiana, lower Amazon valley .... *S. phileomon* (C. & R. Felder)

Fig. 138, South America, showing the distribution of *Scada* species of the *zemira*-group: open circles, *S. zemira* (Hewitson); solid circles, *S. kusa* (Hewitson); open triangles, *S. ortygia* (Druce); solid triangle, *S. huascara* new species; open squares, *S. karschina* (Herbst). No locality data are available for *S. delicata* Talbot.

A. *zemira*-group

Six species belong in this group and have in common male genitalia which are essentially similar, though specifically distinguishable. All six are found in relatively limited areas (Fig. 138). *S. zemira* is known only from western Ecuador; *kusa* has been recorded from the southern part of Ecuador and from the adjacent area of northwestern Peru; *ortygia* is found in southeastern Peru and in Bolivia; *huascara* is from Amazonas, Colombia; *karschina* flies in southeastern Brazil; *delicata* is recorded only from "Brazil".

Scada zemira

This species is easily recognized by the tawny-red spot in the anal angle of the forewing upper side and by the narrow yellow stripes on both wings. The collar is tawny and the patagia are tawny with black fringes exactly like those of *Scada zibia.* The male genitalia are as simplified as can be found in the genus. The valves (fig. 139) have the saccular process, of course, but neither projection on the costa is well developed and the costal margin is gently concave.

Scada zemira (Hewitson), 1856. (Figs. 138, 139, 145)

Ithomia zemira Hewitson, 1856 [1852-1876], 1: [55]; pl. [28]; fig. 115. (Guayaquil, Ecuador). Kirby, 1871: 31. Riley & Gabriel, 1925: 52.
Scada zemira, Weymer, 1890: 65. Haensch, 1909: 137; pl. 36d. Campos, 1927: 12. Bryk, 1937: 543. Fox, 1940: 184.

The holotype male from Guayaquil, Ecuador, is numbered 7258 in the British Museum (Natural History).

Specimens examined, 77 ♂, 50 ♀:

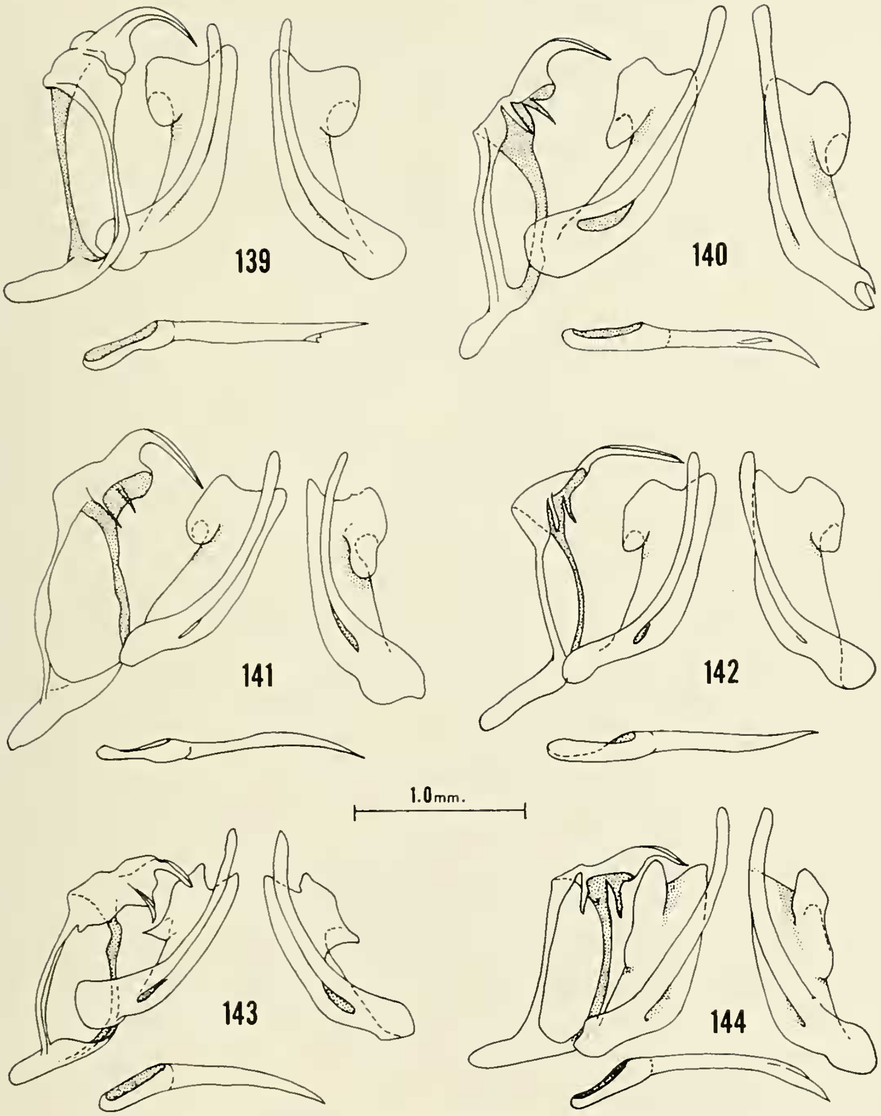
ECUADOR: **Esmeraldas:** Rio Aguaclara, San Mateo, 5 ♂ 3 ♀ (CM, ZSB). **Manabi:** Cojimies, Rio Marcos (?), 12 ♂ 13 ♀ (CM). **Los Rios:** Quevedo, Hacienda Santa Ana Maria (near Quevedo), 3 ♂ 8 ♀ (BM, MSU, PM). **Guayas:** Bucay, Choba, Guayaquil, Naranjal, Isla de Puná, La Puntilla, El Triunfo, 13 ♂ 4 ♀ (BM, CM, MCZ, USNM, ZSB). **Chimborazo:** Chimborazo, 2 ♂ (BM). **El Oro:** Piedras, Portoveijo (as Portovelo), El Oro, 31 ♂ 10 ♀ (AMNH, CM, USNM). **Loja:** Arenillas, 4 ♀ (BM). **Not located:** Santa Rosa (which ?), 1 ♂ (BM). **Vague:** Quito, Ecuador, West Ecuador, 7 ♂ 5 ♀ (BM, CM, CU, MCZ).

PERU: **Tumbes:** Tumbes, 1 ♂ 2 ♀ (PM).

ERRORS: Cauca valley, Colombia, 1 ♀ (BM). Panama (H. M. S. Herald), 2 ♀ (BM).

Scada kusa

Most individuals have the dark cross bar on the forewing forked, with one branch over Cu_1 to the margin and the other over the cubitus (4d), so that the yellow in Cu_1-Cu_2 becomes an isolated patch. When this feature is present, it is diagnostic and is not found in any other species. A few females and one male seen, however, lack the branch over 4d and the cross bar is like that of most other *Scada,* but the characteristics given in the key will serve to distinguish it. Haensch (1909) followed by Bryk (1937) associated *kusa* with *ethica* from which it may be inferred that neither author was acquainted with actual specimens.



Figs. 139-144, male genitalia of *Scada* species of the *zemira*-group, the penis and dissected left valve shown separately, all drawn to same scale. Fig. 139, *S. zemira* (Hewitson), Rio Marcos, Manabi, Ecuador; slide 1449, CM. Fig. 140, *S. kusa* (Hewitson), Loja, Ecuador; slide 503, MCZ. Fig. 141, *S. ortygia* (Druce), holotype, without locality; slide 1243j, BM. Fig. 142, *S. huascara* new species, holotype, La Chorrero, Amazonas, Colombia; slide 682 sub 29 by W. T. M. Forbes, remounted by R. M. Fox, CU. Fig. 143, *S. delicata* Talbot, holotype, "Brazil"; slide 1248j, BM. Fig. 144, *S. karschina*, Gavea, Guanabara, Brazil; slide 495, AMNH.

The ventral process of the male genitalia (fig. 140) is well developed, somewhat thickened at its tip and projects well beyond the top of the valve. The costal margin of the valve is shaped like a flattened *M*, the apex and the anterior projection form blunt teeth with a low, angled concavity between them.

Scada kusa (Hewitson) (Figs. 138, 140, 146)

Ithomia kusa Hewitson, 1874 [1852-1876], 5: [15]; pl. [8], fig. 195 (Ecuador). Riley & Gabriel, 1925: 28.

Scada kusa, Kirby, 1877: 694. Dognin, 1887 [1887-1896]: 7. 1891 [1887-1896]: 33. Haensch, 1909: 137. Campos, 1927: 12. Bryk, 1937: 541. Fox, 1940: 184.

The holotype male from Ecuador is number 7256 in British Museum (Natural History); the genitalia are on slide 1245j, prepared by J. W. Fox.

Specimens examined, 17 ♂ 28 ♀:

Ecuador: **Guayas:** Guayaquil (error ?); 1 ♀ (BM). **Loja:** Loja, 3 ♂ 3 ♀ (MCZ, USNM). **Oriente:** Rio Numbala, Sarayacu (error ?), Zamora, 8 ♂ 14 ♀ (BM, USNM). **Not located:** Chinguilamaca, 1 ♀ (BM).

Peru: **Piura:** Ayabaca mountains, Monji (as "Monja, Ecuador"), 2 ♂ 5 ♀ (BM, CU). **Amazonas:** Charapa, Guajango (?), 2 ♂ (BM). **Vague:** Western slopes of Andes, North Peru, 1 ♂ 2 ♀ (BM).

Error: Mapiri, Bolivia, 1 ♀ (BM).

No Data: 1 ♀ (USNM).

Scada ortygia

Like *kusa*, *ortygia* appears to be quite rare and there are very few records of either. Its large size and simplified pattern make *ortygia* easy to recognize; the forewing cross bar is present, the submarginal dots are absent from the upper side and are confined on the under side to the apices of both wings. The black markings are a little more transparent than in most *Scada*, and this species is transitional to *karschina* both in pattern and in the male genitalia.

The ventral process of the male valve (fig. 141) is longer than in *zemira*, but not as long as in *kusa*, and its tip is not clubbed, though it is blunt. The apex of the valve is pointed, the anterior projection is rounded and the costal margin between them is evenly concave, a little deeper than in *zemira*.

Scada ortygia (Druce) (Figs. 138, 141, 147)

Mechanitis ortygia Druce, 1876: 208; pl. 17, fig. 5 (Huiro, Peru). Riley & Gabriel, 1925: 27.
Scada ortygia, Haensch, 1909: 138. Bryk, 1937: 541. Fox, 1940: 184.
[= *Scada garleppi* Haensch, 1909: 138, *nomen nudum*.]

The holotype, a male in British Museum (Natural History) from Huiru, Peru, is numbered 7237; the genitalia have been prepared on slide 1243j by J. W. Fox.

Specimens examined, 19 ♂, 8 ♀:

PERU: **Cusco:** Callanga, Huadquiña, Huiru (as "Huiro"), Illapani, Quillabamba, Santa Ana, San Miguel, 7 ♂ 6 ♀ (AMNH, BM, CM, PM, USNM). **Madre de Dios:** Upper Rio Madre de Dios, Sheringayoc (near Puerto Maldonado), 2 ♂ 1 ♀ (CU, ZSB).

BOLIVIA: **La Paz:** Coroico, Farinas, 7 ♂ (BM, CU, MCZ, PM). **Vague:** Bolivia, 2 ♂ 1 ♀ (CU, PM).

ERROR: Bahia, Brazil, 1 ♂ (BM).

Scada huascara new species (Figs. 138, 142, 148)

A single male, taken by Professor Forbes in Amazonas, Colombia, externally is very similar to *S. reckia*, but the genitalia place it in the *zemira*-group rather than in the *ethica*-group.

Male. — The collar is black; the patagia are black, each with a small tawny spot at its base (in *reckia* the patagia are largely tawny with black fringes).

The pattern and coloring of the wings are as in *reckia*, except as follows: The black hindmarginal stripe of the forewing is wider in *huascara*, its anterior edge crosses the anal vein toward the cubitus and its posterior edge reaches the margin of the wing; in *reckia* the narrower stripe is limited by the anal vein, does not cross it and does not quite reach the margin of the wing, where there is a yellow stripe; further, this black stripe in *reckia* is beset with numerous yellow hair-scales, but in *huascara* there are few such scales in the black stripe. In *huascara* the yellow subapical patch of the forewing reaches nearer the outer margin of the wing in M_3-Cu_1, the black margin there being narrower, and the end of the patch parallels the margin for the greater part of the distance between these two veins; in *reckia* the black margin at M_3-Cu_1 is somewhat wider and the end of the yellow patch in this cell is rounded.

On the under side *huascara* has definite orange-tawny scaling in the borders, notably between M_3 and Cu_2 on the hindwing and at Cu_1-Cu_2 and at the fork of R_4-R_5 on the forewing; this coloring is entirely absent in most *reckia* specimens, but one female from Bahia has a trace of it on the hindwing.

The male genitalia (fig. 142) have the uncus of an even width, not terminally expanded, and viewed from the side it is down-curved at an angle of about 90°. The valve bears two projections on the costal margin, both about the same height, the apical projection acute and the anterior projection blunt, with the concavity between them forming an angle; the ventral process reaches somewhat beyond the apex.

Holotype ♂. — La Chorrera, Rio Putumayo district, Peru; Aug. 1920; Cornell University Expedition, lot 607, sub 159. Genitalia slide, Cornell lot 682, sub 29. This locality is on the Rio Igaraparaná at approximately 1° S, 73° W, in what is now Amazonas Territory, Colombia.

The species is named for Huascar, son of Huayna Capac who united the Inca Empire.

Scada delicata

The only specimens of *delicata* I have found in any collection are the holo- and allotype in the British Museum (Natural History). This pair was collected in 1848 and is labelled merely "Brazil". No doubt additional material will eventually be found by collectors who are not preoccupied with large, gaudy butterflies, and thus the distribution of the species will be revealed.

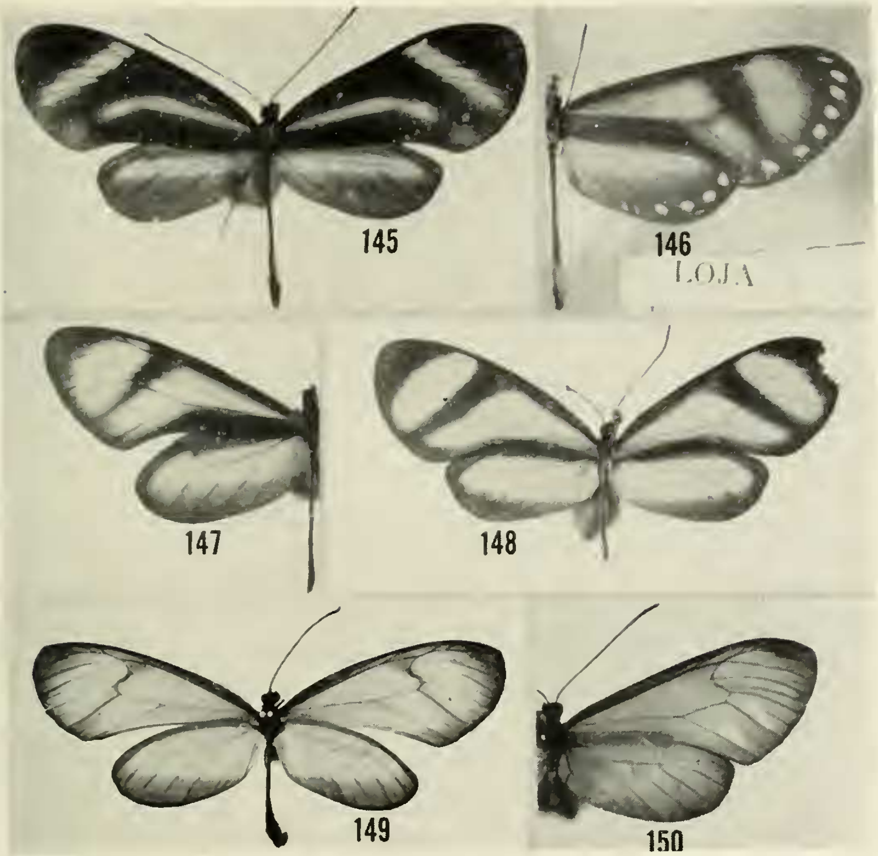
Scada delicata Talbot (Figs. 143, 149)

Scada reckia f. delicata Talbot, 1932a: 191 (Brazil). Bryk, 1937: 542.

The holotype male is number 18435 in the British Museum (Natural History) and the allotype female is number 18436; the male genitalia were prepared by J. W. Fox on slide 1248j.

The original description reads in its entirety: "Differs from the figured *reckia* by the much larger distal forewing patch which is only very narrowly separated from the proximal area." Fortunately, I studied the types and the prepared male genitalia, as this species is very different indeed from *reckia.*

The collar is tawny, not black as in *reckia,* and has a small white spot on either side; the patagia are tawny. As a matter of fact, the only prominent feature in common between *reckia* and *delicata* is the absence of submarginal spots on the upper side and their presence on the under side. The male genitalia (Fig. 143) place *delicata* in the *zemira*-group, as the uncus is tapered and there is no finger-like an-



Figs. 145-150. Fig. 145, *S. zenira* (Hewitson), ♂, El Oro, Ecuador, CM. Fig. 146, *S. kusa* (Hewitson), ♂, Loja, Ecuador, MCZ. Fig. 147, *S. ortygia* (Druce), ♂, Quillibamba, Cusco, Peru, CM. Fig. 148, *S. huascara* new species, holotype ♂, La Chorrera, Amazonas, Colombia, CU. Fig. 149, *S. delicata* Talbot, holotype ♂, "Brazil", BM. Fig. 150, *S. karschina* (Herbst), ♂, Rio de Janeiro, Brazil, CM. One and one-half times natural size.

terior process on the valve. Viewed laterally, the uncus is only lightly down-curved; the ventral process of the valve is very long, with about 14% of its length projecting beyond the apex.

Specimens examined, 1 ♂, 1 ♀:

Brazil: without locality, 1 ♂ 1 ♀ (BM).

Scada karschina

The prior name for this species has been ignored or overlooked, for the most part. Staudinger (1885) pointed out that *gazoria* and *phyllodoce* are the same insect, but it remained for d'Almeida (1939) to present the full synonymy and to make the correct generic assignment. Every structural feature places *karschina* in the *zemira*-group of *Scada*; there is no slightest reason for using Schatz' *Heteroscada*. The species is easily recognized as the only *Scada* lacking a cross band on either wing and having the dark marginal coloring quite translucent and gradually shaded into the yellow discal areas.

Scada karschina (Herbst) (Figs. 138, 144, 150)

Papilio karschina Herbst, 1792: 26; pl. 83, figs. 5, 6 (Rio de Janeiro).
Melinaea karschina, Kirby, 1877: 697.
Heteroscada karschina, Weymer, 1890: 79-80. Berg, 1897: 239. Bryk, 1937: 525.
Scada karschina, d'Almeida, 1939: 78. Fox, 1940: 184.
=*Papilio euritaea*, Drury (not Cramer), 1782 [1773-1782], 3: 17; pl. 13, figs. 4, 6. Menetries, 1855: 20 (as *euritea*).
=*Heliconia gazoria* Latreille, 1820 [1819-1823]: 214 (Brazil). Westwood, 1837, 3: 17; pl. 13, figs. 4, 6.
Mechanitis gazoria, Doubleday, 1847 [1846-1852]: 130.
Melinaea gazoria, Kirby, 1871: 34. Burmeister, 1879b: 16. Staudinger, 1884 [1884-1888]: pl. 30. 1885 [1884-1888]: 61, 72.
Heteroscada gazoria, Schatz, 1886 [1885-1892]: 87, 94; pl. 11. Sanders, 1904: 323. Haensch, 1909: 134; pl. 36d. Bryk, 1937: 525-526.
Scada gazoria, d'Almeida, 1939: 78. Fox, 1940: 184.
=*Salacia phyllodoce* Hübner, 1823 [1816-1827], 2: 25; figs. 339, 340. Scudder, 1875: 264. Kirby, 1908 [1894-1912]: 86, 97; figs. 339-340.
Scada phyllodoce, Kirby, 1871: 23. Scudder, 1875: 61. Staudinger, 1885 [1884-1888]: 61, 72. Kirby, 1908 [1894-1912]: 2. Bryk, 1937: 542. d'Almeida, 1939: 78-79. Fox, 1940: 184.
=*Ithomia yanina* Hewitson, 1856 [1852-1876], 1: [56]; pl. [26], fig. 116 (fig. 115, in text) (Brazil). Riley & Gabriel, 1925: 32.
Heteroscada yanina, Bryk, 1937: 526.

Herbst's collection, according to Horn and Kahle (1935), is in the Berlin Museum and presumably includes the type of *karschina*. Latreille proposed *gazoria* as a replacement for Drury's *euritaea*, a misidentification, and Drury's specimen is therefore the type; it should be in the British Museum (Natural History), but has not been found. The type of *phyllodoce* should be with the Hübner collection in the Vienna Natural History Museum. The type of *yanina* is a male from Rio de Janeiro, numbered 7260 in the British Museum (Natural History). Although I have seen only the last mentioned of these types, all were adequately illustrated, providing unambiguous identification, and there can be no doubt as to the synonymy.

The male genitalia resemble those of *kusa,* but the anterior projection on the margin of the valve is larger.

Specimens examined, 67 ♂, 39 ♀:

BRAZIL: **Minas Geraes:** Bello Horizonte, Caraça, Corcovada, Ribeira Jacinto (as "San Jacinthe valley"), Leopoldina, Minas Geraes, 16 ♂ 12 ♀ (BM, CU). **Espírito Santo:** Espírito Santo, 6 ♂ 1 ♀ (N. H. Mus. Berne, BM). **Guanabara:** Gavea, Lagune de Sacuaresitia (?), Nova Friburgo (as "Neu Freiburg"), Petropolis, Rio de Janeiro, São Fidelis, Tijuca, 31 ♂ 19 ♀. **Not located:** Auro Preto, 1 ♂ (BM); Cantogallo (which ?), 4 ♂ 1 ♀ (MCZ); Chapada (which ?), 1 ♀ (MCZ). **Vague:** "S. A.", Brazil, South Brazil, 4♂ 2 ♀ (BM, MCZ).

NO DATA: 3 ♂ 3 ♀ (BM, CU).

ERRORS: Equat[eur], 1 ♂ (BM); Chanchamayo, Peru, 1 ♂ (BM).

B. *ethica*-group

The six species of this group are characterized by the terminally expanded uncus and the absence of a finger-like anterior process on the valve. All have both collar and patagia black except *reckia* which has the patagia tawny with black fringing scales. The most complete pattern is found in *ethica,* with the hindwing cross bar, but *ethica* is superficially almost identical with *quotidiana,* a species in the *zemira*-group, and the two can be separated externally only with difficulty. For the most part, the species in the *ethica*-group must be identified by differences in the male genitalia, as external characters are inconsistent and unreliable. Most *Scada* species vary somewhat in size in the normal course of events, but some of those of the *ethica*-group carry the matter to extremes; in both *theaphia* and *majuscula* the largest individuals are twice the size of the smallest.

S. ethica is found in eastern Ecuador, south into central Peru, apparently in the higher tropical valley (Fig. 151). *S. reckia* is known from Pernambuco and Bahia, Brazil. *S. theaphia* is recorded from localities near the mouth of the Amazon in Pará and Maranhõa, Brazil. *S. echo* is known only from Benevides, Pará, Brazil. In Peru, generally confused with other species but quite recognizable by the tiny orange dot in the apex of the forewing beneath, is found *S. majuscula junina*; *majuscula majuscula* comes from Bolívar, Vene-

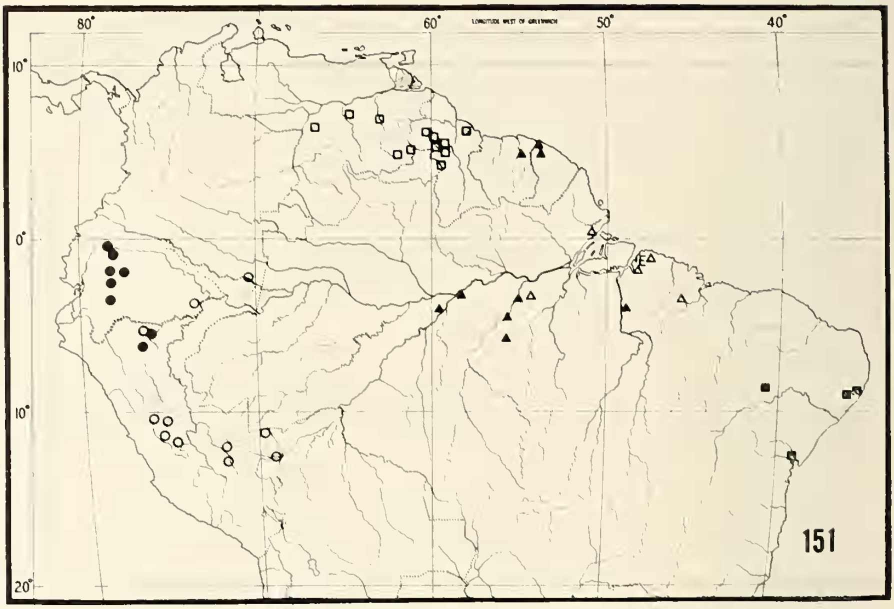


Fig. 151, South America, showing distribution of *Scada* species of the *ethica*-group: solid circles, *S. ethica* (Hewitson); solid squares, *S. rekia* (Hübner); open triangles, *S. theaphia* (Bates); E, *S. echo* new species; open squares, *S. m. majuscula* Haensch; open circles, *S. m. jumina* Bryk; solid triangles, *S. philemon* (C. & R. Felder).

zuela, and British Guiana. *S. philemon* flies in Surinam and French Guiana south into the lower half of the Amazon valley.

Scada ethica

The dark cross bar on the hindwing separates this species from others belonging to this group, but it is a character shared with two species in the *zibia*-group — *quotidiana* and *batesi*. The latter is readily distinguished from *ethica* because the cross bar on its forewing is straight, but the cross bar is angled in both *ethica* and *quotidiana*. These two are best separated from each other by the width of the black margin near the forewing anal margin and by the relative size of the two posteriormost submarginal spots there: in *ethica* the margin is the same width below and immediately above Cu_1, but in *quotidiana* the margin is wider below Cu_1 than in M_3-Cu_1; in *ethica* the two lowest submarginal spots are of equal size or the upper is larger, while in *quotidiana* the lower spot (Cu_1-Cu_2) is always the larger.

It must be noted that *Ithomia excellens* Srnka, assigned as a "variety" of *ethica* by Haensch (1909), is a member of genus *Napeogenes*.

Scada ethica (Hewitson) (Figs. 151, 152, 158)

Ithomia ethica Hewitson, 1861 [1852-1875], 2: [37]; pl. [19], fig. 140 (Cuenca, Ecuador).

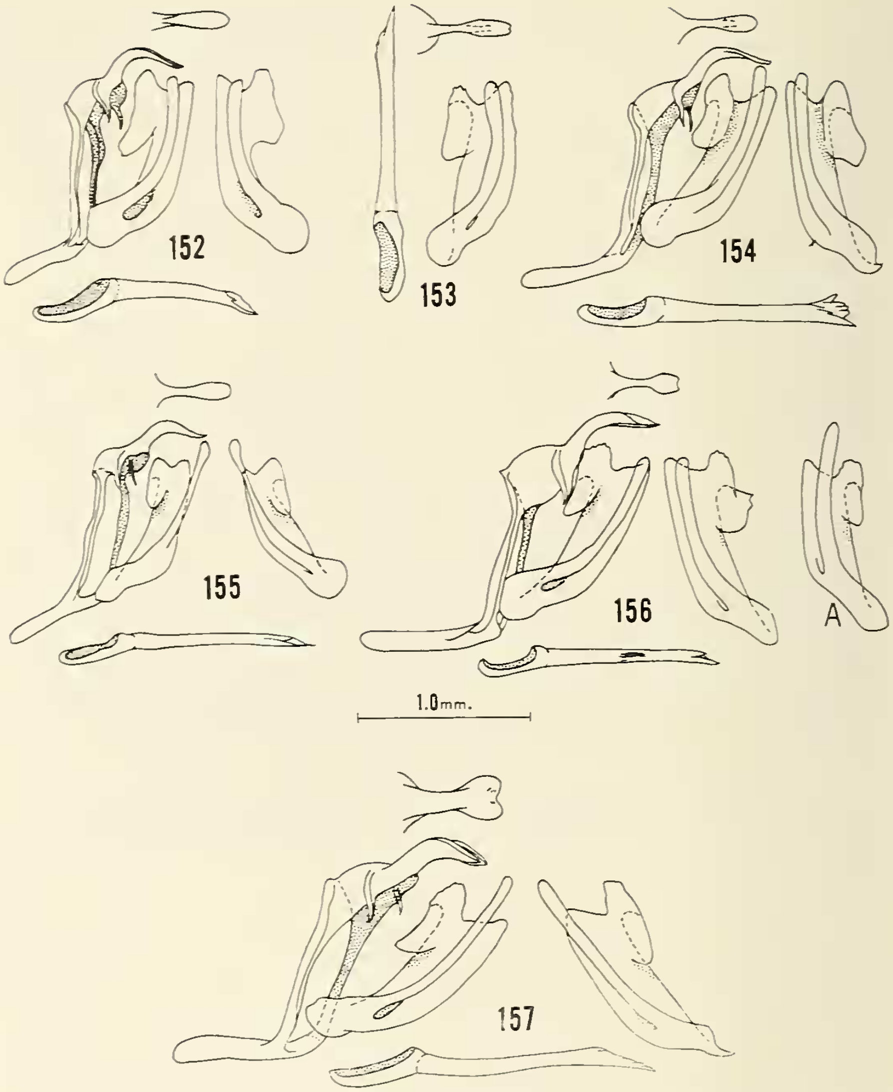
Scada ethica, Kirby, 1871: 23. Dognin, 1891 [1887-1896]: 33. Haensch, 1903: 175, 177, 184, 189. 1909: 137; (not pl. 36d). Campos, 1927: 12. Bryk, 1937: 541. Fox, 1940: 184.

=*Scada ethica lamidia* Bryk, 1953: 39 (Roque, Peru).

Riley and Gabriel (1925: 19) listed type specimen number 7259 as that of *ethica*. The genitalia of this male were prepared on slide 1246j by Jean W. Fox; upon examination, the specimen proved to be *S. batesi*. At my request, Mr. Howarth and Mr. Riley compared type specimen 7259 with the figure of the original type published by Hewitson, with special attention to the distinguishing characters mentioned above and in the key. They concluded that type specimen 7259 was not the model for Hewitson's illustration and therefore not the true type.

Kirby (1879: 44) listed five specimens in the Hewitson collection identified as *ethica*. Mr. Riley and Mr. Howarth were able to locate only four of them and found that none agrees with the Hewitson figure and that none bears the locality "Cuenca", specified in the original description. Furthermore, all four are *S. batesi*, as Mr. Howarth demonstrated with both external features and dissections of the male genitalia.

Since Hewitson stated that *ethica* was represented also in the collection of W. W. Saunders, two possibilities remained: (1) that the true type of *ethica* is the lost fifth Hewitson specimen, or (2) that the true type is in the Saunders material. Horn and Kahle (1935-1937: 239) record that Saunders' butterflies went to Grose-Smith, thence to the Hill Museum; this collection now is in the British Museum through the Joicey bequest. All pertinent specimens were then examined closely by Mr. Howarth in the hope of finding one precisely matching Hewitson's illustration. No such match was found, nor was any specimen among the Saunders' material found to have the locality "Cuenca".



Figs. 152-157, male genitalia of *Scada* species of the *ethica*-group, the penis and dissected left valve shown separately, dorsal view of uncus shown above, all drawn to same scale. Fig. 152, *S. ethica* (Hewitson), Indillama, Oriente, Ecuador; slide 549, RM. Fig. 153, *S. rekia* (Hübner), Bonito, Pernambuco, Brazil; slide 501, AMNH. Fig. 154, *S. theaphia* (Bates), Benevides, Pará, Brazil: slide 444, CM. Fig. 155, *S. echo* new species, holotype, Benevides, Pará, Brazil; slide 1421, CM. Fig. 156, *S. m. majuscula* Haensch, Bolívar, Venezuela; slides 506 and 1427, CM; fig. 156A, left valve of *S. m. junina* Bryk, Satipo, Junín, Peru: slide 515, AMNH. Fig. 157, *S. philemon* (C. & R. Felder), French Guiana: slide 507, CM.

It must be concluded, therefore, that the original type of *ethica* has been lost. In order to preserve the use of the name in its traditional sense, as limited by the external features shown in the Hewitson drawing, it is necessary to designate a neotype. On Mr. Howarth's recommendation, a male labelled "Ecuador: Buckley [*ex* Grose-Smith] Joicey bequest. Brit. Mus. 1934-120" is hereby designated as the neotype of *Ithomia ethica* Hewitson and is numbered 18437 in the collection of the British Museum (Natural History). The genitalia have been prepared by T. G. Howarth, and the abdomen reaffixed after dry dissection.

I examined the holotype of *lamidia* Bryk, from the Stockholm Museum, and could find nothing to justify the name.

The male genitalia (fig. 152) have the blunt anterior projection of the valve slightly higher than the bluntly angled apex, with the costal margin between them rounded and fairly deep; the ventral process extends only a little beyond the costal margin of the valve.

Specimens examined, 40 ♂ 7 ♀:

ECUADOR: Oriente: Rio Anzu, Rio Arajuno, Archidona, Rio Blanco (near Sucua), Churuico [as "Churuyacu"], Gualaquiza, Huagrayacu, Indillama, Puyo, Sarayacu, Timotu (?), [east of] Zamora, East Ecuador and Oriente, 34 ♂ 7 ♀ (AMNH, BM, CHS, CM, CU, RM, USNM, ZSB).

PERU: Loreto: Rio Huallaga, 3 ♂ (AMNH, CM). San Martín: Moyobamba, Roque, 3 ♂ (BM, CM, ST).

Scada reckia

Known only from the states of Pernambuco and Bahia, Brazil, this species has the submarginal white spots lacking on the upper sides of the wings but present on the under sides as tiny dots forming a complete series. Some of the larger individuals have tawny scaling in the black margins on the under sides. The collar is black and the patagia are tawny with black fringes.

Scada reckia (Hübner) (Figs. 151, 153, 159)

Nereis reckia Hübner, 1809 [1806-1838], 1: pl. 3, figs. 1-4 (no locality).
Aeria reckii, Hübner, 1816 [1816-1826]: 9.
Oleria reckia, C. & R. Felder, 1865 [1864-1867]: 367.
Scada reckia, Kirby, 1871: 23. Staudinger, 1885 [1884-1888]: 61. Schatz,

1886 [1885-1892]: pl. 11. 1887 [1885-1892]: 95. Kirby, 1908 [1894-1912]: 8; pl. 3, figs. 1-4. Haensch, 1909: 138. Köhler, 1929: 20. Ribeiro, 1931: 44 (as "rekia"). Bryk, 1937: 542. Fox, 1940: 184. Bryk, 1953: 40.

I have not seen the type, said to be in the Natural History Museum, Vienna, but there can be little question as to the identity of *reckia*.

The valve of the male genitalia (fig. 153) is close to that of *theaphia*, but the apex is a little higher, the projection at the anterior end of the costa a bit lower; the uncus has a long, relatively narrow terminal widening, the sides of which are parallel, and the end is squared. The second discocellular vein of the hind wing is more nearly straight than in any other *Scada* and is proportionately longer, so that the end of the discal cell has a distinctive shape.

Specimens examined, 22 ♂, 17 ♀:

BRAZIL: **Bahia:** Itaparica, Bahia, 13 ♂ 9 ♀ (AMNH, BM, CAS, MCZ, PM). **Pernambuco:** Bonito, Cabo, Quipapá, Pernambuco, 7 ♂ 6 ♀ (BM, CAS, MCZ, USNM). **Vague:** Brazil, 2 ♂ 1 ♀ (BM, PM).

NO DATA: 1 ♀ (AMNH).

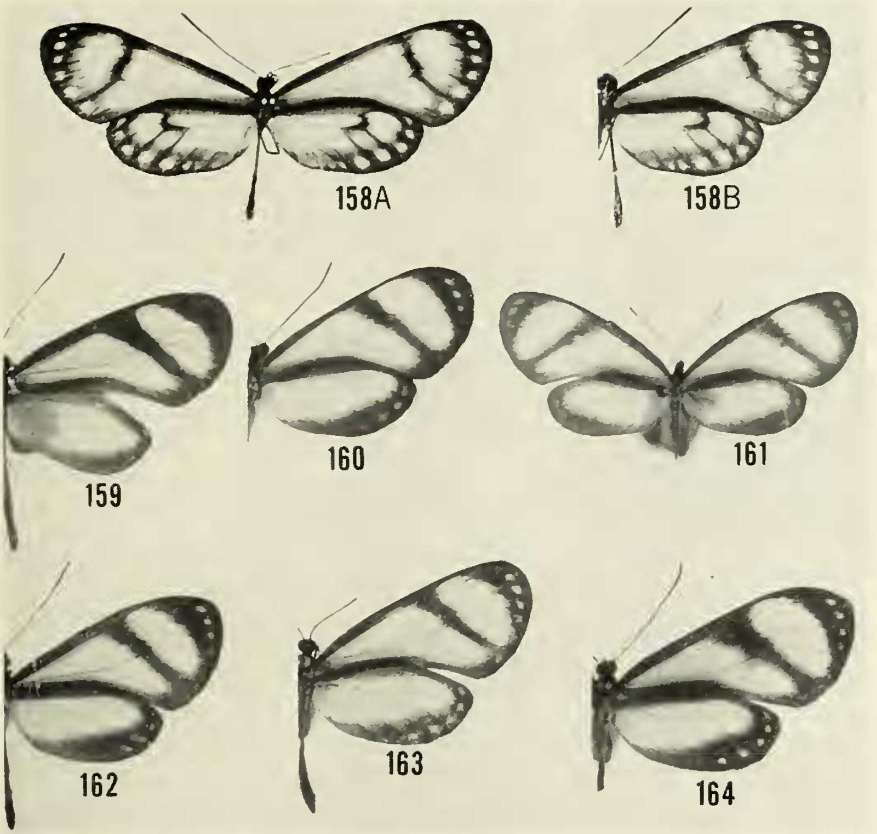
Scada theaphia

Hall (1939) recorded *majuscula* from British Guiana as *theaphia*, stating that he could find no difference between the two; external differences are indeed slight. As a rule, the black margins of *theaphia* are narrower than those of *majuscula*, a condition that may be evaluated by measuring the proportion between the black and yellow parts of M_3 of the hindwing, but this character is unreliable when dealing with smaller individuals. Differences in male genitalia, particularly the shape of the uncus when viewed from above, show clearly that these two species are distinct. Fortunately, the distribution of *theaphia* does not overlap that of *majuscula* and those who do not care to make genitalic preparations can safely sort by locality labels.

Scada theaphia (Bates) (Figs. 131, 132, 151, 154, 160)

Mechanitis theaphia Bates, 1862: 529 (Rio Cupari, Brazil). Riley & Gabriel, 1925: 47.

Scada theaphia, Kirby, 1871: 23. Staudinger, 1884 [1884-1888]: pl. 28. 1885 [1884-1888]: 61. Haensch, 1903: 177. 1905: 162. Kaye,



Figs. 158-164. Fig. 158, *S. ethica* (Hewitson); fig. 158A, upperside, fig. 158B, underside, neotype ♂, Ecuador, BM. Fig. 159, *S. rekia* (Hübner), ♂, Bonito, Pernambuco, Brazil, CAS. Fig. 160, *S. theaphia* (Bates), holotype ♂, Cupari, Rio Tapajóz, Brazil, BM. Fig. 161, *S. echo* new species, holotype ♂, Benevides, Pará, Brazil, CM. Fig. 162, *S. m. majuscula* Haensch, ♂, La Pima, Bolívar, Venezuela, CM. Fig. 163, *S. m. junina* Bryk, ♂, Satipo, Junín, Peru, CM. Fig. 164, *S. philemon* (C. & R. Felder), ♂, Mana Riviére, French Guiana, CM. One and one-half times natural size.

1905: 120. Haensch, 1909: 138; pl. 36d. Bryk, 1937: 542. Fox, 1940: 184.

The holotype male, taken by Bates on the Rio Cuparí, is numbered 7252 in British Museum (Natural History). The paratype female from São Paulo de Olivençia, numbered 7253, is, as Bates (1862) commented, "larger and more vividly coloured" and is *S. batesi batesi*.

The shape of the uncus (fig. 154) is more or less midway between that of *reckia* and that of *majuscula*; the widened tip is elongated, but its sides are evenly curved, not parallel, and the end is rounded.

Specimens examined, 40 ♂, 9 ♀:

Brazil: Amapá: Bragança, 6 ♂ 2 ♀ (BM). Pará: Benevides, Rio Cuparí, Igarapé Açu, Pará, 27 ♂ 5 ♀ (BM, CM, CU). Maranhõa: Maranhõa, 3 ♂ 2 ♀ (BM). Not located: Panore, 1 ♂ (RM). Vague: Amazons, 2 ♂ (MCZ, USNM).

No Data: 1 ♂ (MCZ).

Scada echo new species (Figs. 151, 155, 161)

S. M. Klages collected for Carnegie Museum a fine series of *Scada* near the mouth of the Amazon in October, 1918. All are *S. theaphia* except three males which lack the tawny scaling in the margin of the hindwing on the under side, a feature characteristic of *theaphia*. Examination of the genitalia of these three males demonstrated differences not only from *theaphia* but from all other *Scada*.

Male. — Almost exactly like *S. theaphia* in markings and coloring: Collar and patagia solid black; yellow wings margined with black and with a diagonal postmedian band crossing the forewing, this band widened at the costal margin; submarginal white spots tiny, stronger beneath, not present on either wing below Cu_1 on either side. The only external difference separating *echo* from *theaphia* is the complete absence of tawny scaling in the black margin of the hindwing under side.

Male genitalia (fig. 155). — The valve with only one finger-like process — the ventral process which arises from the base of the sacculus. The uncus, viewed from above, has its terminal part widened, thus placing *echo* in the *ethica*-group. Like all this group except *ethica* itself, the penis is much longer than the diagonal length of the valve. Unlike any other species, the widened part of the uncus is ovoid rather than elongated and its tip is squared, not rounded or bifurcate.

Length of one forewing of holotype is 16.5 mm., of the paratypes 16.0 mm. and 14.5 mm. respectively. In size, these three specimens match the smallest *theaphia* and *majuscula* seen; the forewing length of *theaphia* varies from 20.0 mm. to 15.0 mm. and of *majuscula* from 21.0 mm. to 14.0 mm. Size is a poor criterion for these insects and larger examples of *echo* are likely to be found in the future.

Holotype ♂ and two ♂ *paratypes*: Benevides, Pará, Brazil; S. M. Klages, October 1918; Carnegie Museum Accession 6174. Genitalia of holotype on slide 1421; of paratypes on slides 1420 and 1425, all R. M. Fox.

Scada majuscula

There are two subspecies: *S. m. majuscula* is found in Bolívar, Venezuela, and in British Guiana; *S. m. junina* is distributed from the Rio Putumayo, Colombia, south through eastern Peru to Madre de Dios. Externally, both subspecies scarcely differ from *theaphia* or *echo*, though the broader margins of *m. majuscula* separates most specimens, and *m. junina* is the only *Scada* with a tawny dot in the apex of the forewing under side, but lacking tawny on the hindwing under side. Definitive association is afforded by the male genitalia; the widened part of the uncus is about twice as long as broad and the tip is lightly bifurcate (figs. 156, 156A).

Scada majuscula majuscula Haensch (Figs. 151, 156, 162)

Scada majuscula Haensch, 1905: 162 (Potaro Road, British Guiana). 1909: 138. Ribeiro, 1931: 44. Bryk, 1937: 543. Fox, 1940: 184.
=*Scada theaphia*, Hall (part), 1939: 6. Forbes, 1942: 30.

The original description mentions four males and two females; the series is in Berlin Museum.

As noted in the key and in previous discussions, it is difficult to identify *m. majuscula* by means of the traditional external features, so it is little wonder that Hall (1939) could not separate it from *theaphia*.

Specimens examined, 58 ♂, 12 ♀:

VENEZUELA: Bolívar: Rio Arabapó, La Pima (Rio Caroni, as "La Pinta"), Rio Suapure, Surukum basin (upper Rio Caroni), La Union (Rio Caura), La Vuelta (Rio Caura), 37 ♂ 1 ♀ (BM, CM, CU).

GUYANA: Anadudaru (Potaro River), Annai (as "Aunai"), Bartica, Chenapowu, Ireng River (slopes of Mt. Roraima), Kaieteur Falls, Karanang River (as "Caramang"), Kurupung River, New Amsterdam, Potaro River, Quonga (?), Waramadong, 16 ♂ 6 ♀ (AMNH, BM, CM). Vague: British Guiana, 5 ♂ 3 ♀ (BM, CU).

NO DATA: 2 ♀ (AMNH, CU).

Scada majuscula junina Bryk (Figs. 151, 156A, 163)

Scada theaphia junina Bryk, 1953: 40 (Junin, Peru).

Bryk's description of the single male in his possession mentioned the general size, the submarginal dots, the cross band of the forewing and made a comparison with *theaphia,* but overlooked the only distinctive feature of the pattern — the tawny dot in the apex of the forewing on the under side. Because the Stockholm Museum loaned me the holotype for study I was able to learn the true identity of *junina,* and to find that, quite by accident, Bryk had named a valid species.

As given in the key, *junina* is the sole *Scada* having as the only tawny on the under side a dot in the forewing apex. The size and arrangement of the submarginal dots, the shape of the forewing cross band and the length of the wing do not separate *junina* from *majuscula, theaphia, echo, philemon* or *batesi.* Professor Forbes collected a good series in central Peru in 1920 and noticed (personal communication) that this insect — which he immediately recognized as undescribed — has a chalky-white dorsal stripe on the thorax which is quite obvious on the wing and distinguishes it from the only similar *Scada* in the area, *batesi,* which has the same stripe sulphur-yellow. This distinction is difficult, however, in museum specimens.

Specimens examined, 93 ♂, 36 ♀:

Colombia: **Amazonas:** Tacna (Rio Putumayo), 1 ♂ (CU).

Ecuador: Bucay [Guayas] (error: probably from Oriente), 3 ♂ (ZSB).

Peru: **Loreto:** Rio Amapa, Rio Cachiyacu (near Iquitos), Chambireyacu (near Yurimaguas), Yurimaguas, 4 ♂ 3 ♀ (BM, CU). **Junín:** El Campamento (near Colonia del Perené), Rio Colorado, La Merced, Hacienda Mosela (Rio Oxapampa), Colonia del Perené, Pueblo Pardo (near Colonia del Perené), Satipo, Junín, 62 ♂ 26 ♀ (AMNH, BM, CAS, CM, CU, ST, USNM, ZSB). **Cusco:** Rio Chanchosmayos (as "Chanchamayo"), Rio Paucartambo, 12 ♂ 4 ♀ (BM, USNM, ZSB). **Madre de Dios:** Iberia, Puerto Maldonado, 8 ♂ 3 ♀ (AMNH, CM). **Vague:** Peru, Amazons, 3 ♂ (BM, PM).

Scada philemon

Although externally similar to *theaphia, echo, majuscula* and *junina* of the *ethica*-group and *batesi* of the *zibia*-group, *philemon* has unique male genitalia. The distribution is from Surinam and French Guiana south into the lower half of the Amazon valley in Brazil.

Scada philemon (C. & R. Felder) (Figs. 151, 157, 164)

Oleria philemon C. & R. Felder, 1867 [1864-1867]: 367 (Venezuela ?). Riley and Gabriel, 1925: 39.

Scada philemon, Kirby, 1871: 23. 1908 [1894-1912]: 8. Haensch, 1909: 138. Bryk, 1937: 541-542. Fox, 1940: 184.

The holotype is a male numbered 7251 in British Museum (Natural History), and the genitalia are on slide number 1249j, prepared by J. W. Fox. The holotype has no locality label; the Felders cited "Venezuela" in their original description but questioned its authenticity.

The tip of the uncus (fig. 157) is far wider than in any other species, a condition easily seen in any view.

Specimens examined, 22 ♂, 10 ♀:

SURINAM: Berg en dal, 3 ♂ (BM).

FRENCH GUIANA: Mana Riviére, St. Laurent, 3 ♂ (CM, CU, RM).

BRAZIL: Amazonas: Borba (Rio Madeira), Laginho Maues, 2 ♂ 3 ♀ (BM, CU). Pará: Alcobaça, Itaituba, Rio Tapajós, Rio Tocantins, Pará, 5 ♂ 1 ♀ (BM, CM, ZSB). Vague: Amazonas, Amazon valley, "Am. m.", Brazil, 5 ♂ 3 ♀ (CM, JHM, ZSB).

ERRORS: New Grenada, 1 ♂ (BM); Bucay, Ecuador, 1 ♂ (ZSB); Pebas, Peru, 1 ♂ (BM).

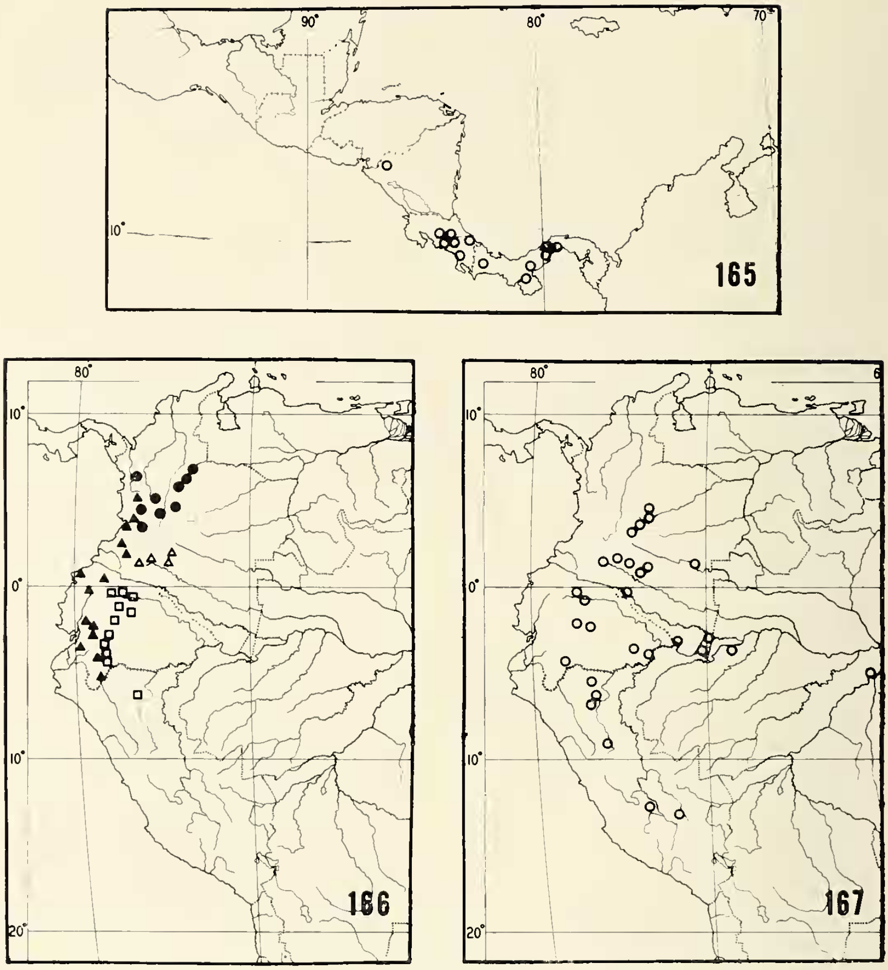
NO DATA: 1 ♂ 3 ♀ (CM, USNM).

C. *zibia*-group

The three species belonging to this group all have on the valve a second finger-like process arising just below the anterior end of the costal margin — a structure not found in the other two groups. The uncus is a little widened near its tip and presents from above the appearance of a spear or an arrow; viewed from the side the uncus is nearly straight.

The length of the penis and the length of the ventral process of the valve distinguish the three species (figs. 168-170). In *zibia* the penis is about the same length as the height of the valve, but the ventral finger-like process is quite long and about one-quarter of its length extends beyond the valve apex. The other two species have the penis about 50% longer than the height of the valve; in *batesi* the ventral process never extends more than a tenth of its length beyond and frequently just reaches the valve apex; in *quotidiana* the ventral process extends by 13% to 20% of its length beyond the apex of the valve.

As to external characters, *zibia* has the collar and patagia reddish-tawny, *batesi* and *quotidiana* have both structures black. These last two species can be separated from each other by the shape of the



Figs. 165-167, distribution of *Scada* species of the *zibia*-group. Fig. 165, southern Central America: open circles, *S. z. xanthina* (Bates). Fig. 166, northwestern South America: solid circles, *S. z. zibia* (Hewitson); solid triangles, *S. z. zeroca* new subspecies; open triangles, *S. q. perpuncta* Kaye; open squares, *S. q. quotidiana* Haensch. Fig. 167, South America: open circles, *S. batesi* Haensch.

dark bar crossing the forewing: in *batesi* the cross bar is straight and a little wider at the costal end, thus resembling the bar found in most *Scada* species; in *quotidiana* the cross bar is angled with the segment over the discocellular veins heavy, ending with a little tooth over the base of M_3 and another over the cubitus (4d), and with the segment over Cu_1 thin and not forming a straight line with the anterior part of the bar — it thus resembles the cross bar on the forewing of *ethica*. In *q. perpuncta* the forewing bar is especially heavy over the discocellulars and virtually obsolete over Cu_1, presenting a distinctive appearance. Surprisingly, the presence or absence of a forked cross bar on the hindwing has no significance in *batesi* and *quotidiana*, although a similar mark is always present in *ethica*. About half the individuals of *q. quotidiana* have the *ethica*-like hindwing cross bar and about five percent of the individuals of *batesi* have it. All specimens seen of *q. perpuncta* have a rounded black blotch in the same position on the hindwing disc.

The *zibia*-group is Andean (Figs. 165-167). *S. z. xanthina*, the only member of the genus reaching Central America, is found in Honduras, Nicaragua, Costa Rica and Panama; *S. z. zibia* is from northern Colombia and extends southward in the valley of the Magdalena; *S. z. zeroca* occurs in the upper Cauca valley and south along the Pacific drainage in Colombia and Ecuador. *S. batesi* has been recorded from the states of Boyacá, Metá, Caquetá and Amazonas, in eastern Colombia, south through Peru to Cusco, and from the western part of Amazonas, Brazil. *S. q. perpuncta* has a restricted range in Caquetá and Putumayo, Colombia; *S. q. quotidiana* is found in eastern Ecuador to San Martín, Peru.

Scada zibia

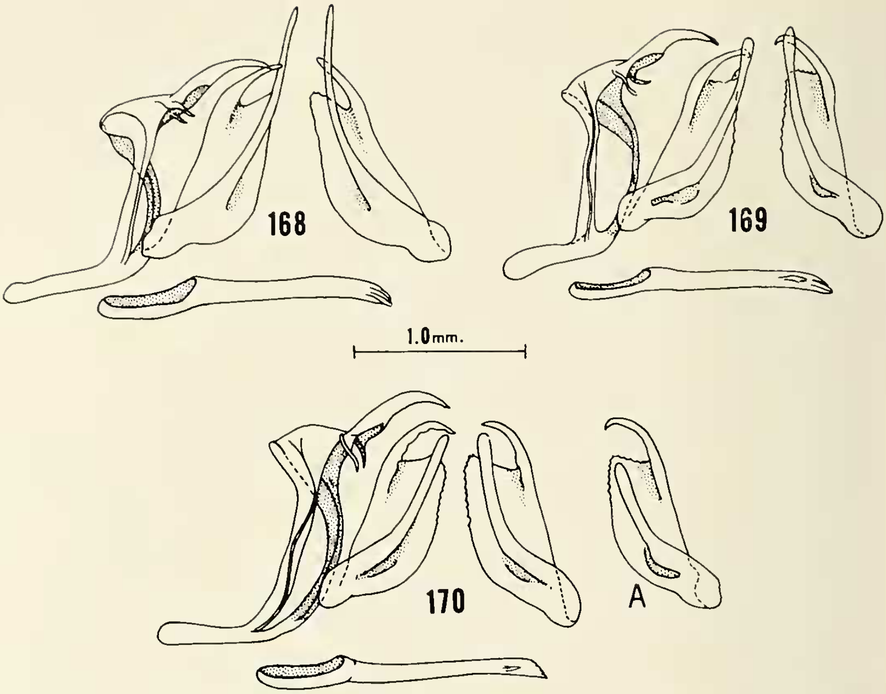
The white submarginal spots in the apex of the forewing are elongated — strongly elongated in *z. zibia* but less so in *z. xanthina* and *z. zeroca*. The three subspecies are easily distinguished by the features mentioned in the key.

Scada zibia xanthina (Bates) (Figs. 165, 168, 171)

Ithomia (*Oleria*) *xanthina* Bates, 1866: 52 (Lion Hill, Panama). Riley & Gabriel, 1925: 52.

Scada xanthina, Kirby, 1871: 23. Butler & Druce, 1874: 334. Godman & Salvin, 1879 [1879-1901], 1: 14; pl. 3, fig. 2. Haensch, 1909: 137; pl. 36d. Dyar, 1914: 145. Prüffer, 1922: (*fide* Kremky, 1925). Kremky, 1925: 237. Bryk, 1937: 543. Fox, 1940: 184.

The holotype is a male from Lion Hill, Panama, number 7254 in the British Museum (Natural History).



Figs. 168-170, male genitalia of *Scada* species of the *zibia*-group, penis and dissected left valve shown separately, all drawn to same scale. Fig. 168, *S. z. xanthina* (Bates), Guapiles, Costa Rica; slide 498, CM. Fig. 169, *S. q. quotidiana* Haensch, Coca, Oriente, Ecuador; slide 1438j, BM. Fig. 170, *S. batesi* Haensch, Rio Ortegazua, Caquetá, Colombia; slide 1444, CM; fig. 170A, left valve of *S. batesi,* Rio Vaupés, Colombia; slide 1440, AMNH. Fig. 170A shows the minimum length observed of the ventral process, in contrast with the maximum length shown on the valves of fig. 170.

The white submarginal spots at the apex of the forewing, though more elongated than in other species, are much less so than in *zibia zibia*; the black cross bar on the forewing — clearly wider at the costal end — is wider and more densely scaled than in *z. zibia* or *z. zeroca*. The male genitalia are indistinguishable from those of the other two subspecies.

Specimens examined, 70 ♂, 28 ♀:

Honduras: Honduras, 2 ♂ (BM).

Nicaragua: Eden, Nicaragua, 4 ♂ (BM, CM).

Costa Rica: Rio Banana, Cachí, Carillo, La Emilea (near Guápiles), Flórida, Guápiles, Volcan Irazú, Juan Viñas, Puerto Limón, Peralta, Rio San

Carlos, Santa Clara, Rio Sixaola, Suretka, Rio Toro, Tres Rios, Turrialba, La Virgen, Zent, Costa Rica, 50 ♂ 20 ♀ (AMNH, BM, CM, CU, HR, MCZ, PM, USNM).

PANAMA: Barro Colorado Island, Calobre, Canal Zone, Cerro Campana, Chiriquicito, Lion Hill, Rio Trinidad, Veraguas, Panama, 11 ♂ 7 ♀ (AMNH, BM, CAS, CM, HR, USNM).

ERROR: Venezuela, 1 ♂ (USNM).

NO DATA: 2 ♂ 1 ♀ (MCZ, USNM).

Scada zibia zibia (Hewitson) (Figs. 166, 172)

Ithomia zibia Hewitson, 1856 [1852-1876], 1: [55]; pl. [28], fig. 114 [fig. 113 in text] (New Grenada). Riley & Gabriel, 1925: 53.

Scada zibia, Kirby, 1871: 23. Weymer, 1890: 17. Haensch, 1909: 137. Hering & Hopp, 1925: 189. Kremky, 1925: 177, 236-237; figs. 128-131, pl. 25, fig. 6. Bryk, 1937: 543. Fox, 1940: 184.

=*Scada amplificata* Haensch, 1905: 162-163; pl. 5, fig. 1 (Muzo, Colombia). 1909: 138. Bryk, 1937: 543. Fox, 1940: 184.

The type from New Grenada, numbered 7255 in British Museum (Natural History) is, as noted by Riley and Gabriel (1925), a female, not a male. The type of *amplificata* is in the Berlin Museum.

This subspecies is characterized by the extreme elongation of the white submarginal spot in R_5-M_1 of the forewing, as is well shown in Hewitson's drawing (1856) of a rather small, delicate female and in Haensch's illustration (1905) of a large, strongly marked male.

Specimens examined, 69 ♂, 34 ♀:

COLOMBIA: **Antioquia:** Frontino, 1 ♀ (BM). **Santander:** Rio Armas, Costa Rica, Rio Suarez, 7 ♂ (AMNH, CAS, CM). **Cundinamarca:** Bogotá, Canache (?), Pandi (as of "Ecuador"), Santa Fé de Bogotá, 17 ♂ 9 ♀. **Boyacá:** Minas (near Muzo), Muzo, Rio Opon, 18 ♂ 6 ♀ (AMNH, BM, CM, CU). **Valle de Cauca:** Espejuelo (near Cali), Santa Rito (Rio Cauca), 8 ♂ (BM). **Tolima:** Rio Aguacatal, Rio Chilí, 2 ♂ 4 ♀ (BM, CU). **Cauca:** Caloto, Coreato (?), Torne (?), 10 ♂ 5 ♀ (BM). **Vague:** Metagang (ob. Caucathal), Interior of Colombia, Upper Orinoco (probably Rio Metá headwaters), Bogotá to Buenaventura, New Grenada, Colombia, 6 ♂ 8 ♀ (AMNH, BM, CM, CU).

ERROR: Huaylas, Peru, 1 ♂ (RM).

NO DATA: 1 ♀ (AMNH).

Scada zibia zeroca new subspecies (Figs. 166, 173)

=*Scada zibia,* Haensch (not Hewitson), 1903: 178. 1905: 163. 1909: 137. Bryk, 1937: 543.

=*Scada reckia*, Campos (not Hübner), 1930: 74.

Haensch misidentified *zibia* Hewitson, incorrectly attributing the name to the population from western Colombia and western Ecuador, rather than to the central Colombian population, with the result that he created the synonym *amplificata* for the true *zibia* and left unnamed the Pacific coast subspecies. The large number of specimens I have seen demonstrate that this is indeed a distinct subspecies, though the male genitalia are exactly like those of *zibia* and *xanthina*.

In pattern and coloring in general, this resembles the other two subspecies, but the forewing cross bar is much narrower and more translucent, consisting of a well scaled black triangle over the discocellular veins at the costa and a triangular streak over Cu_1, these connected by a very translucent segment in which opaque scaling is present only over the base of Cu_1 and over the cubital segment (4d); when a specimen is held obliquely to the light so that the "shadow pattern" on the translucent part is better seen, the cross bar is found to be straight, narrower than the apical margin, so that the yellow postmedian patch is larger than in *zibia*. The white submarginal spot in R_5-M_1 is somewhat elongated but not nearly as much as in *zibia* and but little more than in *xanthina*.

As in the other two subspecies, the hindwing margins are wide and there is no tawny scaling on the under side. Antennae are black, the collar and patagia tawny red.

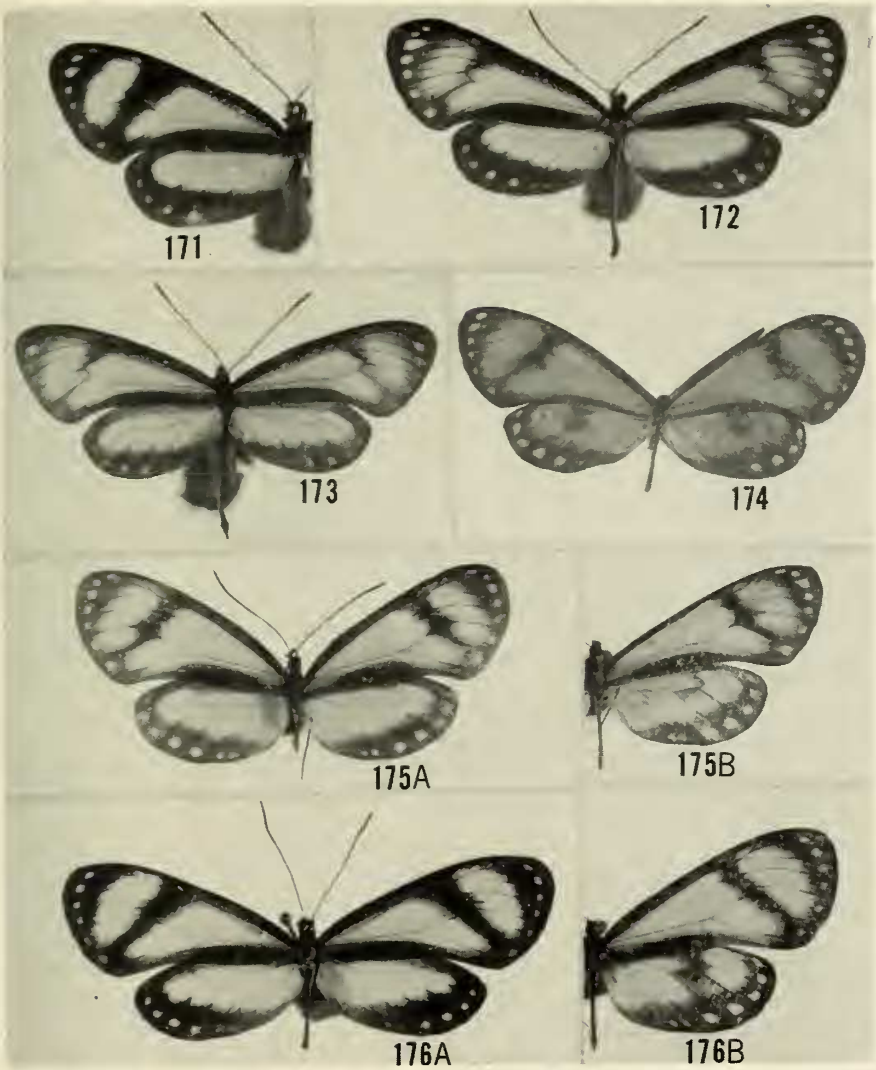
Holotype ♂: Dos Puentos, [Chimborazo], kilometer 99, Ecuador; 1700 feet altitude; W. J. Coxey, January 10, 1929; ANSP lot 133; exchange ANSP, Acc. 20359, in Carnegie Museum.

Allotype ♀: Naranjapata, [Chimborazo], Ecuador; 1859 feet altitude; W. J. Coxey, November, 1926; exchange ANSP, Acc. 20359 in Carnegie Museum.

Paratypes: 178 ♂, 59 ♀:

COLOMBIA: **Caldas:** Itaburi, Jamaraya, Mumbu, Pueblo Rico, Santa Cecelia, 87 ♂ 5 ♀ (AMNH, CM, CU). **Valle de Cauca:** Rio Dagua, 4 ♂ 2 ♀ (BM). **Cauca:** (?) Juntas, 11 ♂ 7 ♀ (BM). **Nariño:** La Guayacana, San Pablo (Rio San Juan), 5 ♂ 10 ♀ (AMNH, BM, CM). **Vague:** Colombia, 3 ♂ 1 ♀ (AMNH).

ECUADOR: **Esmeraldas:** Cachabe to Paramba, Esmeraldas, 14 ♂ 3 ♀ (BM). **Imbabura:** Paramba, 2 ♂ (BM). **Pichincha:** Santo Domingo de los Colorados, Rio Toachi, 11 ♂ 5 ♀ (AMNH, BM, CHS, RM, ZSB). **Los Rios:** La Chima (Rio Juntas), 2 ♀ (BM). **Bolívar:** Balzapamba, 1 ♂ 2 ♀ (BM).



Figs. 171-176. Fig. 171, *S. z. xanthina* (Bates), ♂, Guapiles, Costa Rica, CM. Fig. 172, *S. z. zibia* (Hewitson), ♂, Rio Opón, Boyacá, Colombia, CM. Fig. 173, *S. z. zeroca* new subspecies, holotype ♂, Dos Puentos, Chimborazo, Ecuador, CM. Fig. 174, *S. q. perpuncta* Kaye, ♂, San Vicente de Caquan, Caquetá, Colombia, USNM. Fig. 175, *S. q. quotidiana* Haensch; fig. 175A, ♂ without hindwing band, fig. 175B, ♂ with hindwing band, both Rio Cotopina, Oriente, Ecuador, CM. Fig. 176, *S. batesi* Haensch; fig. 176A, ♂ without hindwing band, Iquitos, Peru, CM; fig. 176B, ♂ with hindwing band, Mocoa, Putumayo, Colombia, CM.

Guayas: Bucay, 3 ♂ 4 ♀ (CM). **Chimborazo:** Chimbo, Dos Puentos, Huigra, Ventura, Chimborazo, 26 ♂ 11 ♀ (BM, CM). **El Oro:** Zaruma, 2 ♂ 3 ♀ (BM). **Loja:** [west of] Zamora, 4 ♂ (BM). **Not located:** Caclamba, 3 ♂ (USNM).

PERU: **Cajamarca:** Rio Chinchipe, 1 ♀ (BM).

VAGUE: Amazonas, 1 ♂ (USNM).

NO DATA: 1 ♂ 2 ♀ (CM, USNM).

Scada quotidiana

There are two subspecies (Fig. 165): *q. perpuncta* is known from Caquetá and Putumayo, Colombia, and *q. quotidiana* from eastern Ecuador. The shape of the forewing cross bar separates *quotidiana* from *batesi*, but especially in the case of numerous individuals of *q. quotidiana*, not from *ethica*. In *ethica* the black margin of the forewing is the same width below as just above Cu_1 and the white submarginal spot above that vein is larger than or the same size as the spot in the anal angle; in *quotidiana* the black margin is decidedly wider below Cu_1 than in M_3-Cu_1, while the submarginal spot in the anal angle is larger than the spot just above Cu_1. The male genitalia are definitively different.

The pi-shaped cross bar on the hindwing disc has been a red herring in the past; correlation with genitalia prove that its presence or absence is an individual matter in both *quotidiana* and *batesi*, though it always is present in *ethica*.

Scada quotidiana perpuncta Kaye (Figs. 166, 174)

Scada perpuncta Kaye, 1918: 83 (Rio Caqueta, Colombia). Gabriel, 1932: 12.

The holotype male from Rio Caquetá is number 18438 in the British Museum (Natural History); genitalia were prepared on slide 1244j by J. W. Fox.

There is relatively little individual variation among the specimens seen. All have the forewing cross bar exceptionally heavy over the discocellular veins and virtually obsolete over Cu_1, and on the hindwing there is a rounded blotch in place of the pi-shaped band. Despite these striking external differences, the male genitalia do not differ from those of *q. quotidiana*.

Specimens examined, 8 ♂:

COLOMBIA: **Caquetá:** Rio Caqueta, Rio Orteguaza, San Vicente [de Caquan], 6 ♂ (AMNH, BM, USNM). **Putumayo:** Mocoa, El Papino, 2 ♂ (AMNH).

Scada quotidiana quotidiana Haensch (Figs. 166, 169, 175)

Scada ethica quotidiana Haensch, 1903: 177-178, 184 (Coca, Ecuador). 1909: 137. Bryk, 1937: 541. Fox, 1940: 184.

The holotype is in the Berlin Museum. A male from Rio Napo and a female from Coca, Ecuador, the latter taken by Haensch, are in the Munich collection and are paratypes.

Haensch saw *quotidiana* as a "variation" of *ethica* in which the hindwing cross bar is lacking. On the basis only of external characters, the association could be correct, but the genitalia, of course, place the two species in different groups. About half the individuals seen of *quotidiana* possess the discal forked bar on the hindwing; such specimens Haensch and others unhesitatingly identified as *ethica*.

Specimens examined, 49 ♂, 6 ♀:

COLOMBIA: **Caquetá** (error ?): San Vicente [de Caquan], 1 ♂ (USNM).

ECUADOR: **Oriente:** Rio Anzu, Rio Arajuno, Churuico (as "Churuyaco"), Rio Cotapino, Coco, [east of] Cuenca, Curuarai, Gualaquiza, Isatsapi (?), Rio Napo, Hacienda Santa Inez, Sarayacu, Sucua, Rio Tutenongoza, [east of] Zamora, Ecuador, 47 ♂ 5 ♀ (AMNH, BM, CM, MCZ, RM, USNM, ZSB).

PERU: **San Martín:** Tarapoto region, 1 ♂ 1 ♀ (BM).

Scada batesi

As indicated in the generic key, *batesi* and *philemon* are not reliably distinguished by features of coloring and pattern, but the male genitalia admit no confusion. A few individuals have a hindwing cross bar like that found in *ethica* and *q. quotidiana*. *S. batesi* is found in the higher valleys on the eastern side of the Andes from Metá, Colombia to Cusco, Peru (Fig. 167).

Scada batesi Haensch (Figs. 135-137, 167, 170, 176)

Scada theaphia batesi Haensch, 1903: 177, 178 (Coca, Ecuador). 1909: 138. Bryk, 1937: 542. Fox, 1940: 184.

=*Scada zibia nigrocollaris* Bryk, 1953: 38-39 (Iquitos, Peru).

=*Scada theaphia dubia* Bryk, 1953: 39-40 (Roque, Peru).

Ithomia ethica, Riley & Gabriel, 1925: 19.

Scada ethica, Haensch, 1909: pl. 36d.

The holotype of *batesi* is in the Berlin Museum. The types of *nigrocollaris* and of *dubia* are in the Stockholm Museum and were loaned to me for study; the former is an absolute synonym for *batesi* and the latter was based on *batesi* specimens with the hindwing cross bar present.

Type number 7259 in the British Museum (Natural History) is not the holotype of *ethica* Hewitson, as listed by Riley & Gabriel (1925: 19), but is a specimen of *S. batesi*; this situation was discussed under *ethica*, above.

Specimens examined, 150 ♂, 38 ♀:

Venezuela (error ?): no locality, 1 ♀ (ZSB).

Colombia: **Boyacá:** Medina, 1 ♀ (CU). **Vaupés:** Rio Caiari, 9 ♂ (AMNH). **Metá:** Macarena Sur (Rio Guayabera), Rio Ocoa, Cañada Quenane, Llanos de San Martín, Villavicençio, 3 ♂ 5 ♀ (AMNH, BM, CAS, ZSB). **Caquetá:** Rio Caquetá, Rio Orteguaza, 30 ♂ 2 ♀ (AMNH, BM, CM). **Putumayo:** Mocoa, 2 ♂ (AMNH). **Amazonas:** Caucayá, La Chorerra, El Encanto, Loreto-yacu, La Sombre, Tarapacá, 44 ♂ 2 ♀ (AMNH, CM, CU). **Vague:** Colombia, Interior, 2 ♂ (BM, USNM).

Ecuador: **Oriente:** Archidona, Coca, Rio Curaray (as "Cuary"), Rio Napo, Rio Negro, Sarayacu, 9 ♂ (BM, CM, CU, USNM).

Peru: **Loreta:** Achinamiza, Rio Cachiyacu (near Iquitos), Chambireyacu (near Yurimaguas), Rio Huallaga, Iquitos, Rio Marañon, Pébas, Rio Santiago, Rio Ucayali, Yurimaguas, 29 ♂ 14 ♀ (AMNH, BM, CM, CU, RM). **San Martín:** Bellavista, Juanjui, Tarapoto region, 3 ♂ 1 ♀ (AMNH, BM). **Huánuco:** Tingo María, 5 ♂ 1 ♀ (AMNH, CM). **Ayachucho:** La Mar, 1 ♀ (CM). **Cusco:** Rio Chanchosmayo, 2 ♂ 2 ♀ (BM). **Not located:** La Salud, 1 ♂ (RM).

Brazil: **Amazonas:** lower Rio Madeira, São Paulo de Olivencia, 6 ♂ 8 ♀ (BM).

Vague: Upper Amazons, 3 ♂ (CU, USNM).

Error: Chiriqui, Panama, 1 ♂ (MCZ).

No Data: 1 ♂ (MCZ).

REFERENCES CITED

D'ALMEIDA, R. F. 1922. Mélanges lépidoptèrologiques. Etudes sur les lépidoptères du Brésil. Berlin, 226 pp.

————. 1923. Notes sur quelques lépidoptères rhopalocères du Brésil. Quelques observations sur les genres de la sous-famille Ithomiinae. Ann. Soc. Ent. France, 91: 239-235.

————. 1937. Notes synonymiques sur les lépidoptères Américains. Lambillionea, 37: 251-257.

————. 1939. Contribution à l'étude des Mechanitidae, 1re Note. Lambillionea, 39: 78-81.

————. 1942. Alguns tipos de gêneros da ordem Lepidoptera. 1^{a} Nota: Rhopalocera, fam. Mechanitididae. Papéis Avulsos Dept. Zool., São Paulo, 2: 179-196.

————. 1945. Revisão do gênero Xanthocleis Boisd., 1870. (Lep. Mechanitididae = Ithomiidae). Arq. Zool., São Paulo, 4: 97-112, ill.

————. 1950. Ligeiras notas sôbre Ithomiidae da America do Sol (Lep. Ithomiidae). An. Inst. Biol. Mexico, 20: 393-397, ill.

————. 1951. Algumas considerações sôbre os gêneros Mechanitis Fabr. e Melinaea Huebn. Bol. Mus. Nac., Brasil, 100: 1-5, ill.

————. 1952. Novas espécies Sul-Americanas da familia Ithomiidae (Lep. Rhopalocera). Bol. Mus. Nac., Brasil, 115: 1-4, ill.

————. 1956. Notas sinonímicas sôbre Ithomiidae (Lepidoptera Rhopalocera). Bol. Mus. Nac., Brasil, 143: 1-18, ill.

————. 1960. Estudos sôbre algumas espécies da família Ihomiidae (Lepidoptera Rhopalocera). Bol. Mus. Nac., Brasil, 215: 1-31; ill.

D'ALMEIDA, R. F. and R. M. FOX. 1941. A revision of the genus *Sais* Hübner. Reading Pub. Mus., Sci. Publ., 3: 1-5; ill.

ANONYMOUS. 1807. [Illiger ?]. Allg. Lit. Zeitg., Halle [Jena], 2: 1180. (*fide* Hemming, 1934).

APOLLINAR, M. H. 1928. Apuntes lepidopterológicos. Bol. Soc. Colombiana Cien. Nat., 17: 180-183.

AURIVILLIUS, P. O. C. 1882. Recensio critica Lepidopterorum musei Ludovicae Ulricae quae descripsit Carolus A. Linné. K. Vetensk. Akad. Hand., 10: 1-188, pl. 1.

————. 1929. Wissenschaftliche Ergebnisse der schwedischen Entomologischen Reisen des Herrn Dr. A. Roman in Amazonas 1914-1915 und 1923-1924. Ent. Tidskr., 50: 153-168.

AVINOFF, A. 1926. Descriptions of some new species and varieties of Rhopalocera in the Carnegie Museum. Ann. Carnegie Mus., 16: 355-374; ill.

BATES, H. W. 1862. Contributions to an insect fauna of the Amazon valley. Lepidoptera: Heliconidae. Trans. Linnean Soc. London. 23: 495-566: ill.

———. 1863. On a collection of butterflies brought by Messers Salvin and Godman from Panama, with remarks on geographical distribution. Proc. Zool. Soc. London, 1863: 239-249.

———. 1864. New species of butterflies from Guatemala and Panama collected by Osbert Salvin and F. du Cane Godman, Esqs. Ent. Monthly Mag., 1: 1-6, 31-35, 55-57, 81-85, 113-116, 126-131, 161-164, 178-180, 202-205.

———. 1866. New species of butterflies from Guatemala and Panama, Supplement. Ent. Monthly Mag., 3: 49-52, 85-88, 133-136, 152-157.

Bayern, Princess Theresa von. 1901. Liste der gesammelten Lepidopteren. Berliner Ent. Zeitschr., 46: 235-289; ill.

Beebe, W. 1950. Migration of Danaidae, Ithomiidae, Acraeidae and Heliconidae (butterflies) at Rancho Grande, North-central Venezuela. Zoologica, 35: 57-68; 1 fig.

Berg, C. 1897. Communicaciones lepidopterológicas acerca de veinticinco Rhopalóceros Sudamericanos. An. Mus. Nac. Buenos Aires, 5: 233-261.

Biezanko, C. M. 1960a. Danaidae et Ithomiidae da zona Missioneira do Rio Grande do Sul. Arq. Ent. (B), Inst. Agr. do Sul, 6 pp.

———. 1960b. Danaidae et Ithomiidae da Zona Sueste do Rio Grande do Sul. Arq. Ent. (A), Inst. Agr. do Sul, 6 pp.

Boisduval, J. 1870. Considerations sur des Lépidoptères envoyés du Guatemala à M. de l'Orza. Rennes, 100 pp.

Brower, L. P., J. van Z. Brower and C. T. Collins. 1963. Experimental studies of mimicry, 7. Relative palatability and Müllerian mimicry among neotropical butterflies of the subfamily Heliconiinae. Zoologica, 48: 65-84; pl. 1.

Brown, F. M. 1941. A gazetteer of entomological stations in Ecuador. Ann. Ent. Soc. America, 34: 809-851; 10 maps.

Bryk, F. 1937. Danaidae II: subfam.: Ituninae, Tellervinae, Ithomiinae. *In* W. Junk, Lepidopterorum Catalogus, part 80: 433-702.

———. 1953. Lepidoptera aus dem Amazonasgebiete und aus Peru gesammelt von Dr. Douglas Melin und Dr. Abraham Roman. Arkiv Zool. K. Svenska Vetensk. Akad., (New Series) 5: 1-268; 9 figs.

Burmeister, H. C. C. 1879a. Description physique de la Rèpublique Argentine. Volume 5, Lépidoptères. Buenos Aires, 525 pp.

———. 1879b. *idem,* Supplément. Buenos Aires, 64 pp., 24 pls.

Butler, A. G. 1869. Catalogue of diurnal lepidoptera described by Fabricius in the collection of the British Museum. British Museum, London, i-v, 1-303, 3 pl.

———. 1873. Descriptions of new species of Lepidoptera. Cistula Ent., 1: 151-177.

————. 1875. On a collection of Lepidoptera from southern Africa, with descriptions of new genera and species. Ann. Mag. Nat. Hist., (4) 16: 394-420.

————. 1877. On the Lepidoptera of the Amazons, collected by James W. H. Trail, Esq., during the years 1873-1875. Trans. Ent. Soc. London, 25: 105-156; pl. 3.

Butler, A. G. and H. Druce. 1874. List of the butterflies of Costa Rica, with descriptions of new species. Proc. Zool. Soc. London, 1874: 330-370.

Campos, R. F. 1927. Catalogo preliminar de los Lepidopteros del Ecuador. Primera parte, Ropaloceros. Rev. Colegio Nac. Vicente Rocafuerte, 9: 1-106.

Capronnier, J. B. 1874. Notice sur les époques d'apparation des lépidoptères diurnes du Brésil recueillis par M. C. van Voixeur dans son voyage en 1872. Ann. Soc. Ent. Belgique, 17: 1-39.

Carriker, M. A., jr. 1910. An annotated list of the birds of Costa Rica, including Cocos Island. Ann. Carnegie Mus., 6: 314-915.

Collenette, C. L. 1928. Observations on the bionomics of the Lepidoptera of Matto Grosso, Brazil. Trans. Ent. Soc. London, 76: 391-411.

Cramer, P. 1775-1791. Papillons exotiques. Amsterdam, 4 vols., ill. See F. M. Brown, 1941, Ann. Ent. Soc. America, 34: 127-238, for dates and authorship.

Dewitz, H. 1877. Neue Schmetterlinge des Berliner Museums. Mitt. Münchener Ent. Verh., 1: 85-91; pl. 2.

Distant, W. L. 1876. The Rhopalocera of Costa Rica. Proc. Ent. Soc. London, 1876: x-xiv.

Dognin, P. 1887-1896. Note sur la faune des lépidoptères de Loja et environs (Equateur). Descriptions d'espèces nouvelles. Paris, 116 pp., 12 pls.

Donovan, E. [1822]-1834. The Naturalist's Repository . . . London, 5 vols.

Doubleday, E. 1844. List of the specimens of lepidopterous insects in the British Museum. Part 1. British Museum, London, 3 parts.

Doubleday, E., J. O. Westwood and W. C. Hewitson. 1846-1852. The genera of diurnal Lepidoptera. London, 2 vols., ill. See F. M. Brown, 1941, Ann. Ent. Soc. America, 34: 127-238, for dates and authorship. Westwood did not contribute to text on ithomids; because of the brevity of descriptions of new species, those illustrated are credited to Doubleday and Hewitson, all other names to Doubleday alone.

Druce, H. 1876. List of the butterflies of Peru, with descriptions of new species. Proc. Zool. Soc. London, 1876: 205-253; pl. 17, 18.

DRURY, D. 1770-1782. Illustrations of Natural History. London, 3 vols.

DYAR, H. G. 1902. A list of North American Lepidoptera. Bull. United States Nat. Mus., 52: i-xix, 1-723.

——————. 1914. Report on the Lepidoptera of the Smithsonian biological survey of the Panama Canal Zone. Proc. United States Nat. Mus., 47: 139-350.

EHRLICH, P. R. and P. H. RAVEN. 1965. Butterflies and plants: a study in coevolution. Evolution, 18: 586-608.

FABRICIUS, J. C. 1775. Systema Entomologiae. Flensburg and Lipsig. 832 pp.

——————. 1781. Species Insectorum. Volume 2. Hamburg, 2 vols.

——————. 1787. Mantissa Insectorum. Sistens eorum species nuper detectas adjectis . . . Volume 2. Copenhagen, 2 vols.

——————. 1793. Entomologia systemica. Emendata et aucta. Volume 3, Part 1, 487 pp. Copenhagen, 1792-1799, 4 vols. + suppl.

——————. 1807. Systema Glossatorum. Mag. Insectenkund, 6: 277-296.

FASSL, A. H. 1915. Die vertikale Verbreitung der Lepidopteren in der Columbischen . . . Ost-Columbien und die Llanos. Ent. Rundschau (Stuttgart), 32: 9-12, 33-35, 39-41, 43-45, 49-50, 55-59, 63-65, 67-68.

FELDER, C. 1862. Verzeichniss der von den Naturforschern der k. k. Fregatte "Novara" gesammelten Macrolepidopteren. Verhandl. k. k. zool.-bot. Gesell., Vien, 12: 473-496.

FELDER, C. and R. FELDER. 1860. Lepidopterologische Fragmente. Wiener Ent. Monatschr., 4: 97-112.

——————. 1862. Specimen faunae lepidopterlogicae riparum fluminis Negro superioris in Brasilia septentrionali. Wiener Ent. Monatschr., 6: 65-80, 109-126, 175-192, 229-235.

——————. 1864-1867. Lepidoptera. *In* Reise der Osterreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859. Zoologischer Teil. Vienna, vi + 549 pp., 140 pls.

FORBES, W. T. M. 1924. The genus Mechanitis Fabr. Jour. New York Ent. Soc., 32: 145-157; 8 figs.

——————. 1927. The genus Melinaea Hübner, with a description of a new species. Jour. New York Ent. Soc., 35: 23-36; pl. 2, 3.

——————. 1930. A new Mechanitis (Lepidoptera, Nymphalidae). Jour. New York Ent. Soc., 38: 317-318.

——————. 1937. Butterfly geography. Proc. Roy. Canadian Inst., (3A) 2: 83-87.

——————. 1940. Las danaides del norte de Venezuela. Bol. Soc. Venezolana Cien. Nat., 6: 308-317.

——————. 1941. The early genera of Ithomiinae. Ent. News, 52: 1-4.

——————. 1942. Note on the butterflies of Venezuelan Guiana. Bol. Ent. Venezolana, 1: 25-36.

——————. 1948. A second review of Melinaea and Mechanitis (Lepidoptera, Ithominae). Jour. New York Ent. Soc., 61: 1-24; pls. 1, 2.

FOUNTAINE, M. E. 1913. Five months' butterfly collecting in Costa Rica in the summer of 1911. Entomologist, 46: 189-195, 214-219.

FOX, R. M. 1940. A generic review of the Ithomiinae. Trans. American Ent. Soc., 66: 161-207; pls. 5-8.

——————. 1941. New Ithomiinae. Reading Pub. Mus., Sci. Publ., 2: 1-27; 1 pl.

——————. 1942. Three new Ithomiinae in the Mengel collection. Reading Pub. Mus., Sci. Publ., 4: 25-27; figs. 5-8.

——————. 1949. The evolution and systematics of the Ithomiidae (Lepidoptera). Bull. Univ. Pittsburgh, 45: 1-12.

——————. 1956. A monograph of the Ithomiidae (Lepidoptera). Part I. Bull. American Mus. Nat. Hist., 111: 1-76; 75 figs., 9 pls.

——————. 1961. A check list of the Ithomiidae, I. Tribes Tithoreini and Melinaeini. Jour. Lepidopterists Soc., 15: 25-33.

——————. 1963. Affinities and distribution of Antillean Ithomiidae. Jour. Res. Lepidoptera, 2: 173-184; ill.

——————. 1965. Additional notes on Melinaea Hübner (Lepidoptera: Ithomiidae). Proc. Royal Ent. Soc. London, (B) 34: 77-82.

——————. 1967. Forelegs of butterflies, I. Introduction; Chemoreception. Jour. Res. Lepidoptera. 5 (in press)

FOX, R. M. and J. W. FOX. 1947. Ithomiinae of Rancho Grande, Venezuela, including two new species. Zoologica, 32: 173-178; 1 pl.

FRUHSTORFER, H. 1907. Verzeichnis der von Herrn Dr. Theodor Koch-Grünberg am abseren Waupes 1903-1905 gesammelten Rhopalocera mit Besprechnung verwanter Arten. Stettiner Ent. Zeitg., 68: 117-164, 207-209; 1 pl.

GABRIEL, A. G. 1932. Catalogue of the type specimens of Lepidoptera in the Hill Museum. London, 40 pp.

GMELIN, J. F., editor. 1790. Caroli a Linne, Systema Naturae per regna tria naturae, ed. 13. Volume 1, part 5, pp. 2225-3020. Leipsic, 3 vols., 1788-[1793].

GODMAN, F. DU C. and O. SALVIN. 1879-1901. Biologia Centrali-Americana. Insecta. Lepidoptera-Rhopalocera. London, 2 vols. See F. M. Brown, 1941, Ann. Ent. Soc. America, 34: 127-238, for dates and authorship. Note that the section on ithomids in the Supplement is cited herein as Godman, 1901.

——————. 1898. Descriptions of new species of American Rhopalocera. Trans. Ent. Soc. London, 46: 105-112.

GUÉRIN-MÉNEVILLE, F. E. 1829-1844. Insecta. *In* G. Cuvier, Iconographie de Règne Animal, ou représentation d'apres nature de l'une des espèces . . . de chaque genre d'animaux. Paris, 559 pp. in 3 vols.

GUPPY, L., JR. 1904. Notes on the habits and early stages of some Trinidad butterflies. Trans. Ent. Soc. London, 52: 225-228; ill.

HAASE, E. 1891-1893. Untersuchungen über die Mimikry auf Grunlage eines naturlichen Systems der Papilioniden. Bibliog. Zool., 8, Lief. 1-3: 1-112, 1-32; pl. 1 (1891). Lief. 4-10: 9-98; pls. 5-14 (1892).

Lief. 11: 99-161 (1893). (The preceding pagination is the original. A consecutively paginated edition in German and an English translation by C. M. Child were published in Stuggart in 1896.)

Haensch, R. 1899. [A note]. Berliner Ent. Zeitschr., 44, Sitzb. 1898: (5)-(6).

————. 1903. Kurzer Bericht über die entomolog. Ergebnisse meiner Ecuador-Reise. Die Ithomiinen meiner Ecuador-Reise. Berliner Ent. Zeitschr., 48: 149-214; 1 pl.

————. 1905. Neue südamerikanische Ithomiinae meiner Sammlung. Berliner Ent. Zeitschr., 50: 142-182; 7 figs., 2 pl.

————. 1909. Familie: Danaidae. *In* A. Seitz, Grossschmetterlinge der Erde, 5: 113-171; pls. 31-41.

Hall. A. 1925. List of butterflies of Hispanola. Entomologist, 58: 161-165, 186-190.

————. 1939. Catalogue of the Lepidoptera Rhopalocera (butterflies) of British Guiana. Agr. Jour. British Guiana, 10: 25-41, 96-104, 146-169, 215-252; pl. 8. A consecutively paginated reprint was issued in 1940 by the British Guiana Department of Agriculture as Ent. Bull., 3: 1-88; 1 pl.

Hancock, G. L. R. 1926. A winter entomological visit to central Brazil. Entomologist, 59: 49-52, 131-137, 168-170, 188-194.

Hayward, K. J. 1939. Rhopaloceros de las Yungas de Bolivia coleccionados en 1931 por P. C. L. Denier. Physis, 17: 375-384.

Hemming, F. 1933. On the types of certain butterfly genera. Entomologist, 66: 196-200.

————. 1934. The generic names of the holarctic butterflies. British Museum (Natural History), London, viii + 184 pp.

————. 1937. Hübner . . . Royal Ent. Soc., London, 2 vols.

Herbst, J. F. W. 1790. Volume 4 (208 pp., pls. 53-80), Natursystem aller bekannten in- und ausländischen Insecten; Schmetterlinge.

————. 1792. Volume 5 (231 pp., pls. 81-117), *Idem.*

Hering, M. 1925. Verzeichnis der gefundenen Arten und Neubeschreibungen. *In* M. Hering and W. Hopp, Eine Sammelausbente des Herrn Werner Hopp aus dem Choco Kolumbiens. Deutsche Ent. Zeitschr. Iris, 39: 188-207; 3 fig.

Herrich-Schäffer, G. A. 1864-1865. Prodromus Systematis Lepidopterorum. Versuch einer systematischen Anordung der Schmetterlinge. Correspondenz-Blatt zool.-min. Ver. Regensburg, 18: 89-112, 123-136, 148-152, 173-181. 19: 63-76, 84-92, 100-106, 132-137. References herein are to a consecutively paged "reprint" distributed by the author, rather than to the original.

Hewitson, W. C. 1852-1876. Illustrations of new species of exotic Lepidoptera. London, 5 vols., 250 colored plates. The pages and plates as published were not consecutively numbered, but the author gave, in the front matter of each volume, instructions for doing so: references herein are to the pages and plates numbered accordingly.

————. 1869-1877. Remarks on and descriptions of new species of butterflies collected by Mr. Buckley in Ecuador. London, 98 pp.

HOFFMANN, C. C. 1940a. Lepidopteros nuevos de Mexico. An. Inst. Biol. Mexicana, 11: 633-638.

————. 1940b. Catalogo systematico y zoogeographico de los Lepidopteros Mexicanos. Subfamilia Mechanitinae (= Ithomiinae). An. Inst. Biol. Mexicana, 11: 663-666.

HOLLAND, W. J. 1931. The butterfly book, 2nd edition, Garden City, New York, xii + 424 pp., 77 pl., 198 figs.

HOPFFER, H. C. 1869. Bericht über Felder's Lepidoptera der Reise der Fregatte Novara. Ent. Zeitg. Stettin, 30: 427-453.

————. 1879. Exotische Schmetterlinge. Ent. Zeitg. Stettin, 40: 47-95, 413-454.

HORN, W. and I. KAHLE. 1935-1937. Über entomologische Sammlungen. Ent. Beihefte Berlin-Dahlem, 2-4: i-vi, 1-536; 38 pls.

HÜBNER, J. 1806-1838. Sammlung Exotischer Schmetterlinge. Augsburg, 3 vols. (see Hemming, 1937).

————. 1816-1826. Verzeichniss bekannter Schmetterlinge. Augsburg, 131 pp. (see Hemming, 1937).

————. 1816-1827. Zutrage zur Sammlung Exotischer Schmetterling bestehand in Bekundigugn einzelner Fleigmuster. Neuer oder Rarer Nichteuropäischer Gattungen. Augsburg, 432 pp., 172 pls. (see Hemming, 1937, and Kirby, 1894-1912).

HUNTINGTON, E. I. 1932. A list of the Rhopalocera of Barro Colorado Island, Canal Zone, Panama. Bull. American Mus. Nat. Hist., 63: 191-230.

JONES, E. D. 1883. Metamorphoses of Lepidoptera from São Paulo, Brazil. Proc. Literary Phil. Soc. Liverpool, 36: 23-73; pls. 3-6. 37: 257-259; pl. 7.

JUNGE, G. C. A. and C. F. MEES. 1958. The avifauna of Trinidad and Tobago. Zool. Verhandel., no. 37: 1-172.

KAYE, W. J. 1904. A catalogue of the Lepidoptera Rhopalocera of Trinidad. Trans. Ent. Soc. London, 52: 159-224; pls. 17, 18.

————. 1905. Transparency in wings of Lepidoptera. Ent. Rec. Jour. Variation, 17: 83-86, 115-121; pl. 3.

————. 1907. Notes on the dominant Müllerian group of butterflies from the Potaro district of British Guiana. Trans. Ent. Soc. London, 54: 411-439; pls. 23-27.

————. 1918. New species and races of Ithomiinae in the Joicey collection. Ann. Mag. Nat. Hist., (9) 1: 77-86.

————. 1921. A catalogue of the Trinidad Lepidoptera Rhopalocera. Mem. Dept. Agr. Trinidad and Tobago, 2: 1-163; 1 pl.

KIRBY, W. F. 1870. Notes on the butterflies described by Linnaeus. Trans. Ent. Soc. London, [18]: 133-152.

——————. 1871. A synonymic catalogue of the diurnal Lepidoptera. London, vii + 690 pp.

——————. 1873. [Entries as editor.] Zool. Rec., 1871: 359. (Since the editor was also the author of the two genera, *Aprotopus* and *Scada*, for which type-species were designated, the action was clearly valid.)

——————. 1877. Supplement to a synonymic catalogue of the diurnal Lepidoptera. London, pp. 691-883.

——————. 1879. Catalogue of the collection of diurnal Lepidoptera formed by the late William Chapman Hewitson. London, 246 pp.

——————. 1894-1912. Facsimile edition of Hübner's Zutrage zur Sammlung Exotischer Schmetterlinge. Brussels, 1 vol. text, 3 vols. plates.

KÖHLER, P. 1923. Fauna Argentine, I — Rhopalocera. Zeitschr. Ins. Biol., 18, Sonderbeil: 22 pp.

——————. 1929. Las mariposas Argentinas. Danaidae. Rev. Soc. Ent. Argentina, 4: 303-332; pl. 1-6, 1 text fig.

KREMKY, J. 1925. Neotropische Danaididen in der Sammlung des Polnischen Naturhistorischen Staatsmuseums in Warschau. Ann. Zool. Mus. Polinici Hist. Nat., 4: 141-275; 9 pls., 193 text figs.

LATREILLE, P. A. 1820. *In* P. A. Latreille and J. B. Godard, 1819-1823, Encyclopedie methodique. Histoire naturelle des insectes, volume 9. Paris, 828 pp., 163 pls.

LICHY, R. 1943. Observaciones y rectificaciones sobre lepidópteros recolectados por P. J. Anduze en los estados orientales de Sucre y Monagas, cuya enumeración se publicó en el Boletín de la Sociedad Venezolana de Ciencias Naturales, nor. 32, 1938. Bol. Soc. Venezolana Cien. Nat., 8: 205-232.

LIMA, A. M. DA COSTA. 1936. Terceiro catalogo dos insectos que vivem nas plantas do Brasil. Minist. Agr., Rio de Janeiro, iv + 460 pp.

LINNÉ, C. VON. 1758. Systema naturae. Editio decima. Stockholm, 824 pp.

——————. 1767. Systema naturae. Editio duodecima, vol. 1, part II. Stockholm.

LUCAS, H. 1857. Diurnes. Vol. 9, 310 pp., 531 figs. *In* D. Chenu, Encyclopedie d'histoire naturelle. Paris.

MAY, E. 1924. Migraçoes de borboletas no Bresil, com especial referencia á *Mechanitis nessaea*. Bol. Mus. Nac. Brasil, 1: 165-166.

MEERBURG, N. 1789. Plantae rariores vivis coloribus depictae.. Leyden, xxvii pp., 55 pls.

MÉNÉTRIÉS, E. 1855. Enumeratio corporum animalium musei imperialis Academiae Scientiarum Petropolitanae. Part I: Lepidoptera Diurna. Petropolis, Brazil, viii + 97 pp., 6 pls.

MOREIRA, N. 1881. Metamorphose de uma Heliconia. Arch. Mus. Rio de Janeiro, 4: 1-13; pl. 1.

MÖSCHLER, H. B. 1876. Beiträge zur Schmetterlings-Fauna von Surinam. Verh. zool.-bot. Gesell. Wien. 26: 293-352.

MOULTON, J. C. 1909. On some of the principal mimetic (Müllerian) combinations of tropical American butterflies. Trans. Ent. Soc. London, 56: 585-606; pls. 29-32.

MÜLLER, P. L. S. 1774-1775. Insecten. Vol. 5, Part 1 (1774) and Part 2 (1775). *In* Des Ritters C. von Linne . . . volständiges Natursystem . . . Nürnberg, 6 vols. and supplement in 9 vols., ill., 1773-1776.

MÜLLER, W. 1886. Südamerikanische Nymphalidenraupen. Zool. Jahrb., 1: i-x, 1-225; 4 pls.

PETERSEN, B. 1964. Monarch butterflies are eaten by birds. Jour. Lepidopterists' Soc., 18: 165-169.

POUJADE, G.-A. 1895. Voyage de M. E. Simon au Venezuela. Lépidoptères. Bull. Soc. Ent. France, 1895: cxl-cxlv.

POULTON, E. 1908. Secondary mimetic resemblance of Ithomiinae to the danaine genus Ituna. Proc. Ent. Soc. London, 56: vii-xi.

PRITTWITZ, O. VON. 1865. Beitrag zur Fauna des Corcovado. Ent. Zeitg. Stettin, 26: 123-143, 307-325.

PRÜFFER, J. 1922. Neue Former von Schmetterlinger Peru. Arch. Nauk. Biol. Tow. Nauk. Warsz., 1 (2): 1-8; 2 pls. (*fide* Kremky, 1922; not seen.)

REAKIRT, T. 1865. Descriptions of some new species of Danainae. Proc. Ent. Soc. Philadelphia, 5: 217-223.

————. 1866. Descriptions of some new species of diurnal Lepidoptera. Proc. Acad. Nat. Sci. Philadelphia, 18: 228-249, 331-342.

————. 1868. Descriptions of some new species of diurnal Lepidoptera. Proc. Acad. Nat. Sci. Philadelphia, 20: 87-91.

REUTER, E. 1896. Über die Palpen der Rhopalocera. Acta Soc. Sci. Fennicae, 22: 1-577; 6 pls.

RIBEIRO, V. DE M. 1831. Lepidopteros de Matto Grosso. Bol. Mus. Nac. Rio de Janeiro, 7: 31-52.

RILEY, N. D. 1919. Some new Rhopalocera from Brazil collected by E. H. W. Wickham, Esq. Entomologist, 52: 181-186, 200-202.

RILEY, N. D. and A. G. GABRIEL. 1925. Catalogue of the type specimens of Lepidoptera Rhopalocera in the British Museum. Part II. Danaidae. British Museum (Natural History), London, 53 pp.

RÖBER, J. 1904. [A note.] Societas Ent. (Zurich), 19: 105.

————. 1930. Neue Falter. Ent. Zeitschr., 44: 19-21; ill.

ROSENBERG, W. F. H. and G. TALBOT. 1914. New South American butterflies. Trans. Ent. Soc. London, 61: 671-682.

RUDOLPHI, J. W. 1804. [Dissertation] no. 23. *In* C. P. Thunberg (Praeside), Museum naturalium Academiae Upsaliensis. Upsala, 1787-1821, issued in 33 separately paginated parts.

SANDERS, C. B. 1904. On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830. Ann. Mag. Nat. Hist., (7) 13: 305-323; pl. 6.

SCHATZ, E. 1885-1892. Die Familien und Gattungen der Tagfalter. Vol. 2, 284 pp., 50 pls. *In* O. Staudinger, Exotische Schmetterlinge. Fürth, 2 vols.

SCUDDER, S. H. 1875. Historical sketch of the generic names proposed for butterflies. Proc. American Acad. Arts Sci., 10: 91-293.

SEITZ, A. 1910. Alphabetisches Verzeichnis . . . Danaiden. *In* A. Seitz, Grossschmetterlinge der Erde, 5: 165-171.

————. 1927. Das System der Schmetterlinge. 3, Die Danaiden. Ent. Rundschau, 44: 32, 35-36, 39-40, 44, 47-48.

————. 1932. Goyaz-Reise (iii). Ent. Rundschau, 49: 11-15, 17-21, 41-47, 73-77, 91-94, 105-109, 118-123, 129-133, 139-143, 151-152, 197-200, 205-210, 218-219, 228-231, 238-243, 253-256; 1 pl., 7 text figs.

SEMPER, G. 1886-1892. Die Schmetterlinge der Philippinischen Inseln. Beitrag zur Indo-Malayischen Lepidopteren-Fauna. *In* C. Semper, Reisen im Archipel der Philippinen, (2) 5. Weisbaden.

SEPP, J. 1828-1855. Surinaamsche Vlinders. 3 vols. (usually bound as one). Amsterdam.

SHARPE, E. M. 1890. On a collection of Lepidoptera made by Mr. Edmund Reynolds on the Rivers Tocantins and Araguaya and in the Province of Goyaz, Brazil. Proc. Zool. Soc. London, 1890: 552-577.

SHEPPARD, P. M. 1965. The monarch butterfly and mimicry. Jour. Lepidopterists' Soc., 19: 227-230.

SILVA, B. RAUMUNDO DA. 1907. Ralatorio geral. Contribuição para a historia natural dos Lepidopteros do Brasil . . . Rio de Janeiro, 182 pp., 34 pls.

SNELLEN, P. C. T. 1887. Bejdrage tot de Kennis der Lepidoptera von het Eiland Curacao. Tijdschr. Ent., 30: 9-66.

SRNKA, A. 1884. Exotische Notizen. Ent. Zeitschr. Stettin, 45: 295-298.

STAUDINGER, O. 1884-1888. Exotische Tagfalter. Vol. 1, 333 pp., 100 pl., 1 map. *In* O. Staudinger, Exotische Schmetterlinge. Fürth, 2 vols.

STICHEL. H. 1901. [A note.] Berliner Ent. Zeit., 46, Sitzb.: (17).

STRECKER. H. 1872-1900. Lepidoptera, Rhopaloceres and Hereroceres, indigenous and exotic; with descriptions and colored illustrations. Reading, Pennsylvania, 143 pp., 15 pls., and 3 separately paginated supplements.

TALBOT, G. 1928. Systematic account of the butterflies concerned, together with descriptions of the new forms. Trans. Ent. Soc. London, 76: 411-414; ill.

————. 1932a. New species and forms of Lepidoptera from South America. Bull. Hill Mus., 4: 189-197.

————. 1932b. Lepidoptera collected by Dr. Salt in North Colombia. Bull. Hill Mus., 4: 198-205.

THIEME. O. 1899. [Remarks.] Berliner Ent. Zeitschr., 44, Sitzb.: (12).

TODD, W. E. C. 1942. List of the hummingbirds in the collection of the Carnegie Museum. Ann. Carnegie Mus., 29: 271-370.

TODD, W. E. C. and M. A. CARRIKER, JR. 1922. The birds of the Santa Marta region of Colombia: a study in altitudinal distribution. Ann. Carnegie Mus., 14: 3-582.

TURTON, W. 1802-1806. A general system of nature . . . translated from Gmelin's last edition of the . . . Systema Naturae . . . amended and enlarged. London, 7 vols., ill.

WEISMAN, A. 1913. Vortäge über Desendentheorie. University of Freiburg, Jena, 2 vols.

WESTWOOD, J. O. (editor). 1837. Illustrations of exotic entomology . . . by Dru Drury. A new edition brought down to the present state of the science . . . London, 3 vols.

WEYMER, G. 1884. Exotische Lepidopteren, II. Ent. Zeitschr. Stettin, 45: 7-28; pls. 1, 2.

———. 1890. Lepidopteren gesammelt auf einer Reise durch Colombia, Ecuador, Peru, Brasilian, Argentinien und Bolivien in den Jahren 1868-1877 von Alphons Stübel. *In* A. Stübel, Reisen in Süd-amerika. Berlin, vi + 182 pp., 9 pl.

———. 1894. Exotische Lepidopteren, VII. Beitrag zur Lepidopterenfauna von Rio Grande do Sul. Ent. Zeitschr. Stettin, 55: 311-322.

———. 1899. Einige neue Neotropiden. Berliner Ent. Zeitschr., 44: 289-318; pl. 3.

WILLIAMS, C. B. 1930. The migration of butterflies. Biol. Monogr. & Manuals, no. 9. Edinburgh & London, xi + 473 pp., 70 figs.

ZIKAN, J. F. 1935. *Hypoleria arpi* eine neue Neotropide aus Brasilien. Nebst Ergänzungen zu den Beschreibungen von *Aprotopos simplicior* Röb., *Ithomia drymo* Hbn., *I. pellucida* Weym. und *Episcada pascua* Schs. Ent. Rundschau, Stuttgart, 52: 66-68, 73-76; 5 fig.

———. 1940-1942. Beschreibungen neuer neotropischen, Papilionidae, Pieridae, Danaidae und Satyridae. Ent. Zeitschr., Frankfurt, 54: 147-151, 154-159, 205-208, 249-254 (1940). 55: 13-16, 19-24, 81-84, 107-111 (1941), 269-278; 35 figs. (1942).

Index of Taxa

A trinomial entry (as, *isthmia* Bates, *M. i.*) refers to the subspecies, a binomial entry (as, *isthmia* Bates, *M.*) refers to the species as a whole. Legally non-existent names are placed in quotation marks and printed in roman type. Names originally proposed improperly but subsequently validated are followed by the name of the original author in brackets and then that of the validating author (as, *argentea* [Prüffer] Fox, *M. d.*). Taxa described in the text as new are entered in bold face type.